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Electrical World

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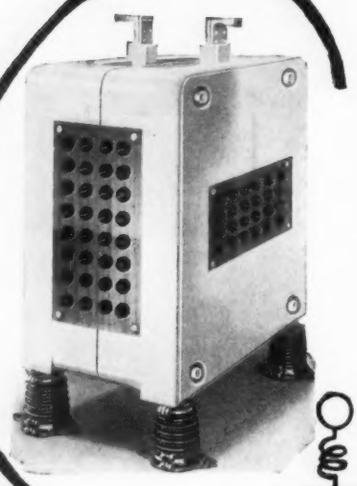

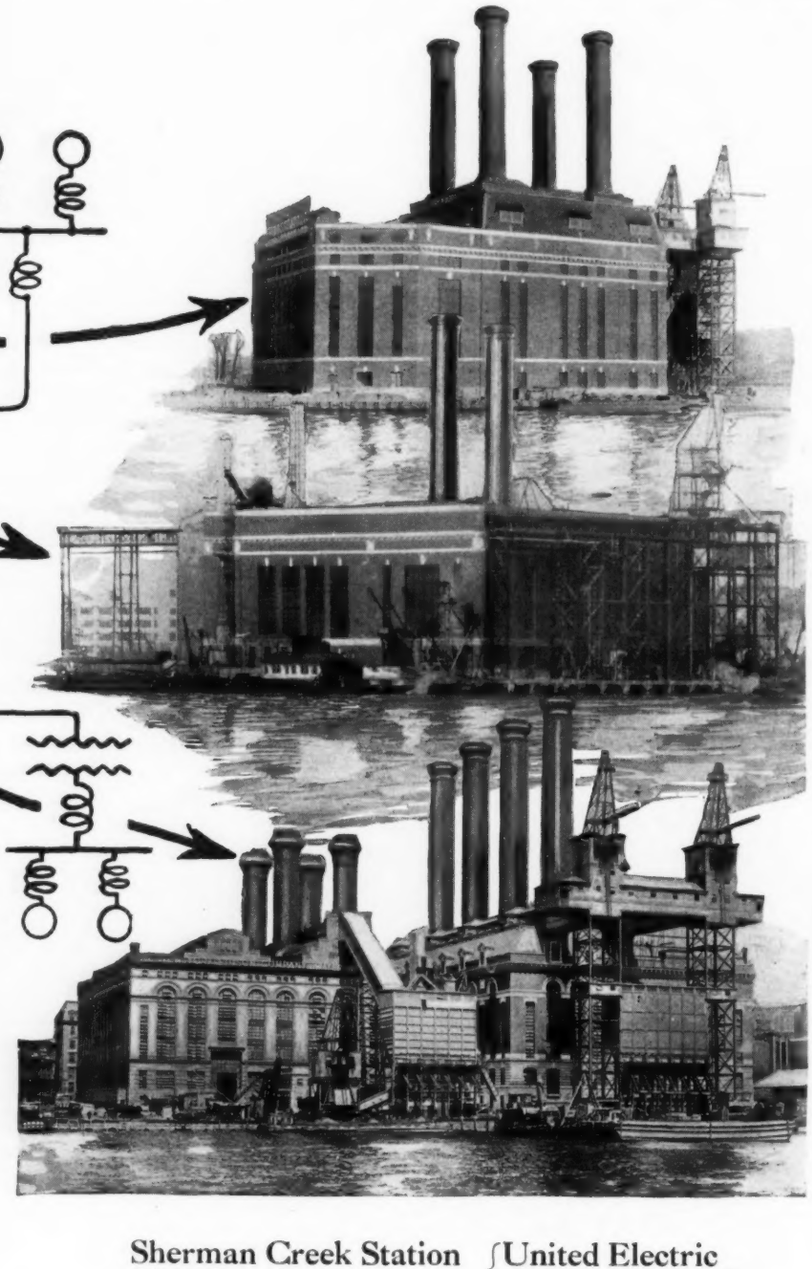

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Public Utility Bonds and Savings Bank Investments

IN ELEVEN states savings banks may invest a portion of their funds in the securities of public utility companies. Other states have thus far not permitted savings banks this privilege, although many would gladly avail themselves of the opportunity provided the securities are "gilt-edge." Nothing short of that should be permitted. The hard-earned savings of the people must under no circumstances be jeopardized, staked or wasted. Better that the money stick in vaults than that the accumulated pittances of years be loaned on securities of questionable value. For that reason the National Electric Light Association's committee on relations with financial institutions has shown commendable caution in suggesting a model law governing savings bank investments. It has been careful to provide that only public utility bonds of exceptional merit be available for this purpose. The proposed amendment to the savings banks law provides that the utility whose bonds are offered must be under the jurisdiction and supervision of a public service commission, that its outstanding capital stock shall be at least two-thirds of the total mortgage indebtedness, that for ten years it shall have paid regularly its principal and interest, that for a period of five years the net earnings shall have averaged annually not less than twice the interest charges on the total outstanding indebtedness, that the bonds offered must be either first mortgage bonds, refunding mortgage bonds, underlying bonds or guaranteed first mortgage bonds, and that not more than 25 per cent of the assets of any savings bank shall be available for investments of this kind. With these stringent provisions any public utility executive and every savings bank officer can conscientiously indorse the amendment and work for its passage. It offers one way of using the people's money for a popular service with mutual profit and without danger to the principal.

Los Angeles Wants to Drink the Colorado River

AN ENTIRELY new element was thrown into the Colorado River situation last week by the all-day testimony of William Mulholland, the veteran chief engineer of the Los Angeles Department of Public Service. Los Angeles, said Mr. Mulholland, is getting thirsty as she expands in size and now wants to drink the Colorado River—or at least a part of it. And Los Angeles is not joking about this, he insists, but, on the other hand, frightened by the water shortage resulting from the present drought, is getting desperate with reference to an adequate supply for the future. How desperate will appear in what follows:

Los Angeles' proposal is to supplement her existing water supply, which is calculated to care for two million population, by providing a means of taking from the Colorado an amount at least equal to her present maximum provision. Interest attaches not to the water to be taken but to the method and its consequences. The water would be withdrawn from the river at a point below all power dams and below most irrigation works. It would be what would otherwise become surplus or useless water. But to get the water Los Angeles must raise it over the mountains—a lift of some 1,200 ft. is involved—and to do this would offer to become a permanent customer of Boulder Canyon power house to the extent of 200,000 continuous horsepower, or one-third of the total power to be developed there. This amount of power would not be used, however, until the city's present gravity supply should have proved inadequate and until the maximum amount of water now contemplated should actually be needed.

That Los Angeles will have to drink is certain. But that she will have to go into another water basin and take not only water but a large block of power is not so certain. The subject will bear investigation; but what is important is that if this is a requisite to Los Angeles' future existence, it is evidence that new and substantial factors in the Colorado River development may appear from any unexpected quarter.

Study the Problem as a Whole, Not Piecemeal

AS THE congressional hearings progress on development of the Colorado River, it is increasingly apparent that the problem presented by this river is not fundamentally different from that of any other stream. The ultimate best interests of all concerned in its development will be conserved only when all the elements of the entire problem shall have been studied and a comprehensive, basic plan for the whole devised and adopted. Such a plan may not be consummated for half a century or for a century; but only by attacking the problem in this way can any group of those interested be sure their own interests will best be served. If the work shall proceed on a basis of a project now and a project then, any undertaking subsequent to the original one may modify the early results.

All those who are experienced in the development of rivers with a view to power, to irrigation and to flood control realize these facts. More than one instance can be cited of prominent engineers refusing even to report upon a specific development on a river without first being allowed to provide an ultimate plan for the stream as a whole. More than one example can also be shown, where actual development has been made, to prove the practical value of having proceeded on a comprehensive basis.

All seem to be agreed that flood control and protection of the Imperial Valley are the prime requisites in the Colorado River situation at present. No congressional committee could quickly determine the adequate plan for power and irrigation development even if power markets and irrigable lands were now waiting. It would seem that Congress will be doing a great service if it provides

some measure of flood control soon and at small cost. Then, before any general expensive and permanent program is undertaken, there can be made a complete analysis of the entire Colorado River, with its tributaries. A suggestion along these lines has already been made—to erect a low dam at Topock—and has been commented on in these columns. Meanwhile Secretary Work's report, based on the study his engineering advisers are making, will be awaited in the hope that it will definitely indicate a way to provide immediate protection and outline a suggestion for a comprehensive survey of the entire river.

Practices in Auxiliary Drive and Heat-Balance Maintenance

THE trend toward stage bleeding and electric auxiliary drive has introduced several problems in station design whose solutions are yet to be determined or standardized. The major element in the design is to control the heat balance and to obtain an absolutely reliable power supply for the auxiliaries. In addition, the use of alternating-current motors for all the drives or for only part of them influences the layout very greatly.

When auxiliary power is taken from the main bus it is essential to provide protection of the power supply against bus disturbances, and some of the methods used are described in the article by F. M. Billheimer in this issue. At best the use of reserve units, multiple bus taps and duplicate transformer taps introduces a great deal of necessary complexity. The more recent practice of driving auxiliary generators through direct connection to the shafts of the main units provides an efficient means for isolating auxiliaries from the main bus during normal operation, and one or more emergency connections to the main bus can be used to insure service should trouble develop in the auxiliary generators. In interconnected stations with live buses at all times this scheme also solves the station starting problem.

A modification of this method was suggested by A. L. Penniman, Jr., in a recent paper at the midwinter A. I. E. E. convention. He grouped the auxiliaries into essential and non-essential divisions, provided for bus service to non-essential auxiliaries and used a small main-shaft unit for supplying the essential auxiliaries. This scheme offers a good solution to the problem under certain specific design and operating conditions.

A method which seems to have great merit is yet to be tried in this country. It should be considered seriously for the very large stations. It involves two distinct power stations under one roof in that Diesel engines and waste-heat boilers would be used for auxliary power supply and heat-balance control. The Diesel electric units in combination with waste-heat boilers offer a combination which gives a thermal efficiency of at least 50 per cent and in addition afford many operating advantages. This scheme deserves very careful investigation in the near future.

In the state of flux existing in the art of station design it is difficult to predict the future of any present trend as all elements are so intimately associated that a change in one influences the others. But it is encouraging to note that the tendency in auxiliary drive, although brought about by the influence of stage bleeding, is toward a greater simplicity, reliability and efficiency than has existed hitherto.

The Mercury Boiler Is Making Progress

INTEREST in the initial commercial application of the mercury turbine and boiler has been so intense that many engineers have forgotten that the development has been under way for about ten years. This long development furnished a basis for the expected results at Hartford. Informal preliminary reports from that city indicate fuel economies of the order of 13,000 B.t.u. or under per kilowatt-hour and encourage the belief that this method of power generation must be reckoned with in the central-station designing of the very near future. Substantial reductions below the figure named are to be anticipated if present indications are borne out along the line of utilizing higher mercury-vapor pressures, the design and application of multistage turbine units and the use of equipment of at least three times the rated output of that at present in service. It is extremely significant that troubles not intrinsic to the mercury process have been chiefly responsible for the shutdowns which have thus far been experienced.

Such marked fuel economy warrants the attention of power-plant engineers, but of course this is but one phase of the problem. Service reliability, costs of adaptation, operating safety and convenience—these and other factors are of absorbing importance in the development of all types of prime movers. Wear and tear and maintenance thrust themselves into the center of the stage and demand a hearing for a long time after a new product like the mercury boiler goes into money-making duty. Not many engineers appreciate the extraordinary difficulties of design and construction which have accompanied the pioneer work of Mr. Emmet and his assistants in this field. It is hardly too much to say that practically every essential detail in the design of the mercury boiler and the valves, heaters, governors, condensers and pipe joints used has demanded original development. This does not mean that performance has been rendered uncertain through the absence of standard steam-plant material, but that the progress of the mercury boiler and turbine has taken increased time by virtue of the painstaking steps required to traverse unexplored territory.

A comparison of the tribulations of the first steam-turbine installation, also at Hartford, favors the mercury-boiler outfit. A record of service interruptions during the first year of steam-turbine operation lately given out by Vice-president Ferguson of the Hartford company revealed an amazing amount of difficulty. Per contra, a recent examination of the Hartford mercury-turbine installation after a total service of about 750 hours indicated that wear on buckets was virtually nil and there was little sign of oxidation. The trend of mercury boiler and heater design is in the direction of sectionalized units which can be removed and cleaned, permitting in future practice a well-considered maintenance schedule. Much smaller quantities of mercury will be required per unit of capacity in future developments. In this connection it is noteworthy that expert opinion holds that the supply of mercury can be expanded to meet prospective developments in the power generating field. Certainly this development is in a most interesting stage, and it is to be hoped that detailed performance figures will be released for publication to the engineering industry in the near future.

A Useful Extension of Pole-Treating Methods

READERS of the article on the "Swedish Methods of Impregnating Poles in Service," by Einar Hedenlund, printed elsewhere in this issue, will realize that the treatment described is in no way a new one, but its method of application is unique and it would seem to have real possibilities at least for the more modest pole-treating work. The practice in this country has been almost universally to treat poles in the yard before they are set, although several years ago an effort was made to introduce a method of sealing the pole above the ground line by the installation of a compound between a collar placed around the pole and the pole itself. The compound was intended to seal the pole and prevent the entrance of any moisture. So far as is known, however, this was tried only in a very limited way and its success is problematical.

Other methods of treating poles that are in service have all provided for the reinforcement of the pole in order to extend its life. One or two of these plans have been used quite extensively and doubtless with economy to the pole user. But these methods of treating poles in place do not care for the important point brought up by Mr. Hedenlund, namely, pole seasoning, with the attendant checks which affect materially the progress of pole decay. That the method described in Mr. Hedenlund's article will care for seasoning checks seems reasonably assured, and therefore good results and prolonged life should result.

It is evident from both the illustrations and text of the article that this method is primarily intended for use in connection with poles that are in position, but why should not such a treatment be applied to poles in the pole yard? It is evident that the necessary equipment would be much less expensive than the equipment required for the open-tank treatment or any treatment whose effectiveness would be at all similar to that obtained by the Swedish method. It would seem worth while to make a study of the development of such a plan for pole-yard use, and of course its desirability will depend entirely on the cost of treatment per pole. It certainly seems a more practical scheme for the small dealer or the small user than many other treatment schemes now in general use.

Community Score Card and Public Utilities

BY AN executive order of the President of the United States issued on January 12, 1923, a Federal Council of Citizenship Training was established, consisting of representatives of various federal departments, bureaus and boards. This council has now published a "Community Score Card" by filling out which and adding the individual ratings any person or organization can get an estimate of how high or low a community stands in a particular respect or on the average. The card includes questions on mental development, health, vocational opportunities, patriotic, social, moral development, etc., and undoubtedly represents a great deal of thought and study on the part of the council. This card may be of assistance to public utilities in planning developments in new communities.

One obvious omission on the card is the complete lack of questions of any kind pertaining to public utilities. Yet it is difficult to conceive how a fair picture of an urban community can be had without knowing anything about its street lighting, use of power, street cars, telephones and so forth. Since the council asks for suggestions, why should not the associations representing various public utilities formulate a few questions to be added to the next edition of the card?

Rainbow Chasing Still in Fashion

EVERY so often the electrical industry is confronted by a new order of rainbow chasers. Men flit hither and yon chasing the rainbow of excellent service for very little money. They forget, if they ever knew, that one cannot get something for nothing, that an ounce of gold is worth more than twenty dollars and cannot be bought for five. Bubbles such as these have been pricked years ago, and the same common sense responsible for their collapse will eventually drive away the rainbow of excellent electric service for little money. To render good electrical service requires labor, equipment, coal, water and skillful management. Though better and better service should be the aim of every electric light and power company, still, if the service is good, there is no need of apologizing for it, and it is worth every cent it costs. In fact, electricity is cheap at any price. When, therefore, some demagogue blows bubbles iridescent with the grandeur of service, the thing to remember is that they are chiefly of hot air and one pin prick of fact is sufficient to cause them to burst.

Turbine Dollars Versus Appliance Dollars

A VISITOR to the headquarters of one of the large managing-operating organizations in New York the other day called upon the chief engineer and found him in the midst of an array of blueprints and documents that covered the walls and table of the directors' room. A contract for a turbine was just being signed. All the machinery of large organization was turning over ponderously. Every safeguard of accuracy and responsibility was being invoked and the importance of the transaction was fully apparent and recognized.

The visitor left and on his way dropped into the office of the general commercial manager and found him seated with a salesman in his small private office, with his pen poised above a paper. He signed it with a flourish, tossed the sheet to the salesman and said, "Well, there's a piece of business worth while," and, turning to the visitor, he added, "Six hundred thousand dollars' worth of cleaners for all our properties—some order!"

The thought in mind is neither that the engineering department made too much fuss over the purchase of the turbine nor that the commercial department bought its cleaners too nonchalantly. But the difference made it clear that this organization is much more deeply concerned with its generating equipment than with the apparatus that it buys and sells to use the energy that its stations generate. This is probably right and entirely natural, and yet the fact that vacuum cleaners today can total such large figures is beginning to bring this kind of purchase also into a position of relatively large importance. For the performance of equipment for the customers' use involves the quality of the service and influences public relations. There is more to the appliance business than selling. The selection and purchasing of these service-giving devices is fast becoming a matter that is worthy of executive attention.

Francis Hodgkinson

An engineer, designer and inventor who has been largely instrumental in developing steam turbines

THE electrical industry depends very largely on steam turbines for the production of energy, and yet it was not until 1895 or thereabouts that these devices became commercially available. Only because of the very valuable engineering and designing work of two or three men has it been possible to achieve the results that are now so astonishing. In Francis Hodgkinson the Westinghouse interests found a brilliant and industrious engineer who stamped their turbine products with the mark of his individuality. He took up the work of Parsons and amplified and extended it to include the monster prime movers now working so efficiently in many plants. Curtis, Hodgkinson, Parsons, Rateau—these names are associated with steam turbines and to these men economical energy production is due.

Mr. Hodgkinson received his primary education in the Royal Naval School at New Cross, London, England, leaving there in 1882 to take up an apprenticeship with Clayton & Shuttleworth, agricultural engineers, where he remained until 1885. In that year he entered the employ of C. A. Parsons & Company and was engaged in steam turbine and generator work, first as a machinist, then as a draftsman and finally as superintendent of field week.

In 1890 Mr. Hodgkinson left the employ of Parsons & Company and enlisted in the Chilean Navy. In 1892 he became associated with Percy Burbank, agent for the Thomson-Houston Company and engineer for the telephone company and electric light company of Lima, Peru. The next two years he was engaged with Backus & Johnson, who owned mining properties. From 1894 to 1896 Mr. Hodgkinson was employed by C. A. Parsons & Company as general foreman of erecting and fitting shops.

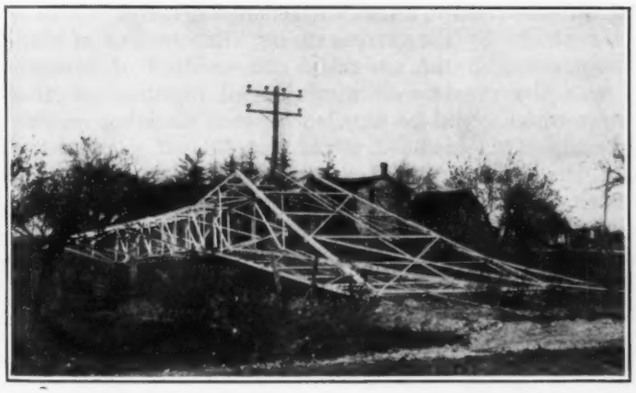
Mr. Hodgkinson became connected with the Westinghouse Machine Company in 1896, upon the recommendation of C. A. Parsons, taking charge of the engineering and designing of Parsons-type turbines, for the manufacturing of which the American rights had just been obtained in 1895. This position he still retains, and in addition he was in 1916 appointed chief engineer of the South Philadelphia works of the Westinghouse company, in charge of all the engineering departments.

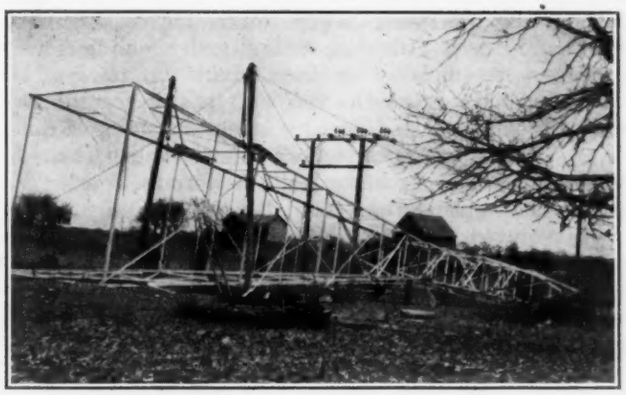
To various engineering societies, to the technical press and to the universities Mr. Hodgkinson has contributed splendid articles and lectures on the subject of turbines.

Erecting Towers Assembled on Ground

Entire Steelwork Assembled on Ground and Tower Erected by Shear-Leg Carried and Operated by Caterpillar Tractor—Arrangements for Receiving and Distributing Steel, Handling the Work of Assembly and Erection

A RATHER unusual procedure, that of assembling steel towers entirely on the ground and then erecting them, has been followed by the Public Service Company of Northern Illinois in building the 27-mile, 132,000-volt double circuit steel-tower line from Evanston to Waukegan, Ill., which may eventually form a part of the loop system connecting the larger plants of this company with those of the Commonwealth Edison Company in Chicago. Aside from the novelty of this method of assembly and erection, this job is particularly interesting because about 50 per cent of it had to be installed on the Skokie Marsh next to a wooden-pole power line, about one-half of which is so close to the steel-tower line that the bases of the towers fall inside the overhang of the wooden-pole circuits. The work was particularly difficult because the greater portion of the line is off highways and ordinary means of transportation of materials could not be used in many cases. The types of footings required for the straightaway, semi-strain and full-strain towers required considerable engineering ingenuity because of the peculiar soil conditions.





DETAILS OF TOWER ERECTION AT SUCCESSIVE STAGES

Each tower is assembled in practically this form on ground by the first assembly crew and the assembly finished by the follow-up crew. Ordinarily the upper half shown in inclined position is hinged just below the lower cross-arm instead of at point shown. The follow-up crew, equipped with wooden gin poles, raises the hinged section and inserts the bolts and webbing.

The follow-up crew has raised hinged section and is bolting up members. In some cases the diagonal ties between the section next to the ground and the upper horizontal section are attached at their upper ends by the assembly crew and the lower ends fastened and upper bolts tightened by the follow-up crew, after raising the upper horizontal section into the position shown.

To expedite construction it was found advisable to divide the contracts for the towers between two manufacturers, orders for the strain, semi-strain and transposition towers being given to one, while the other received the orders for the suspension towers. The general construction of these towers, with their over-all dimensions and weight, is shown in the accompanying drawings. In general they consist of 85-ft. sections with 5-ft., 10-ft. and 20-ft. extensions, depending on requirements. The strain towers are of particularly heavy construction, as shown by the illustrations. The number of members in each tower as well as the number of bolts is indicated opposite each tower. This factor, as might be expected, had considerable influence on the speed of assembly.

Distribution of the steel for the towers was facilitated by having the manufacturers make railroad deliveries at each end of the line and at three intermediate points, other means of transportation radiating from these delivery points and insuring the shortest travel to the tower site. Each piece of steel was numbered by the manufacturer to correspond with the respective member of the tower, thus facilitating sorting in the storage yards, collection of the steel for transportation to the tower sites and assembly at these points. These steel members as well as the bolts were sorted into piles at the storage yard, and the vehicle employed for transporting them to the tower site moved from one end of the storage yard to the other, picking up the desired parts in order, it being thus made sure that all parts would be available when deliveries were made at the site. Trucks and tractors were employed to transport the steel from the storage yard to the tower site, the type of vehicle selected depending on the relative accessibility of this site. The caterpillar tractor which was one of the four tractors used was able to navigate under almost every condition encountered.

At the tower site the steel was sorted and laid out on the ground in an order which agreed with the corresponding numbers on the working blueprint. Thus little time was wasted in finding parts during the assembly process. The assembly and erection of towers was divided between four general types of crews—assembly, follow up, erection and shift-over. Seven men composed all but the follow-up crew, which had five men. The shift-over crew would not have been necessary had it not been that, as pointed out before, some of the towers could not be erected directly on their footings but had to be raised at one side of the center line and then shifted over. The assembly and erection of the semi-strain and strain towers was handled by

SOME OF THE DIFFICULTIES IN ERECTING THE TOWERS IN MARSHY LAND. IN ONE ILLUSTRATION THE MEN ARE FASTENING GUYS USED IN TOWER ERECTION, WHILE IN THE OTHER THE ASSEMBLY CREW IS WORKING IN A MARSH

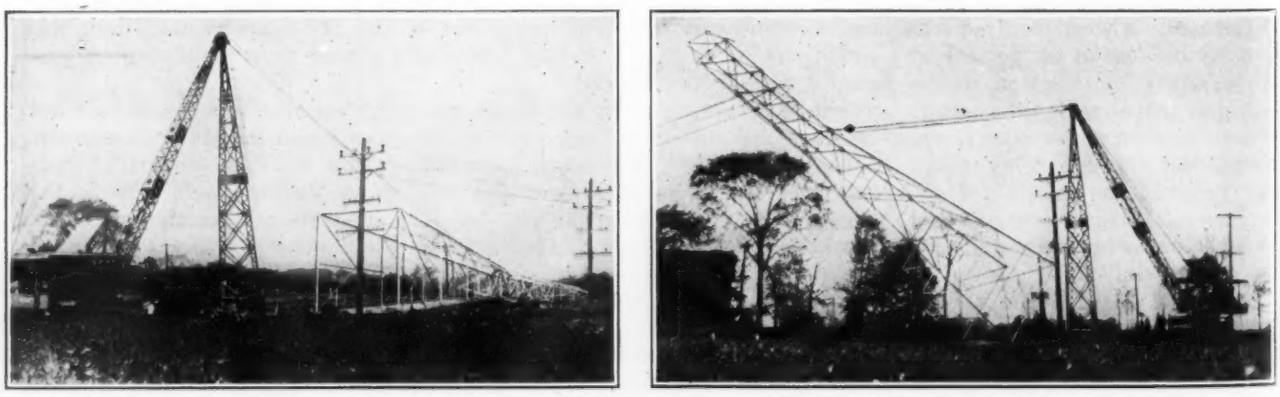
crews which worked upon nothing else and hence became particularly fitted for this work, which was different in some respects from that of assembling and erecting the straightaway towers. Five assembly crews and three follow-up crews under one general foreman were employed on the straightaway towers.

In selecting men for the various types of crews both regularly employed and floating labor was used. From the regularly employed labor the most experienced men with some executive ability were selected for "straw bosses" and the remainder employed for work which required the most skill. The floating labor was used for the work requiring less skill. As will be evident after the method of erection is described, it was important that the members of the follow-up crew be agile men.

To enable simultaneous assembly and erection of the towers along the entire line and to avoid working from one end clear through to the next, the assembly and follow-up crews were spread along the line, several miles apart. Behind the assembly crews at a certain distance traveled the follow-up crews. This arrangement had the effect of stimulating competition, because the assembly crews were eager to keep ahead of the follow-up crews and the follow-up crews were just as anxious to overtake the assembly crews. The number of men in these two crews was determined largely by the fact that an assembly crew of seven men could assemble about one tower a day, whereas the follow-up crews could complete the assembly of about one and a half towers a day with only five men. The type of terrain affected the number assembled greatly.

As shown by the accompanying illustrations of different steps in the assembly and erection of towers, it was the practice to assemble all members of the tower which could be handled by men standing on the ground. This included all of one side of each tower and the head. The first assembly crew could also fasten together the other two legs of the tower and hinge them just below the lower cross-arms. Some of the cross-bracing was attached and the remainder of the tower was left for the follow-up crew to insert the members and bolt them. On some of the towers it was found convenient to omit the cross-arms and place them after the tower was erected, owing to the simplicity of attachments.

Where tower footings were so close to the existing wooden-pole circuits as to be within the overhang of the conductors, it was necessary to assemble the towers with the legs offset from the footings to permit erecting them without striking the existing power circuits. In some places the footings were put below ground level to harmonize with any grading which might possibly follow in this vicinity some day. As a result, in assembling the steel towers the ground had to be trenched to allow the legs to fall in the proper position

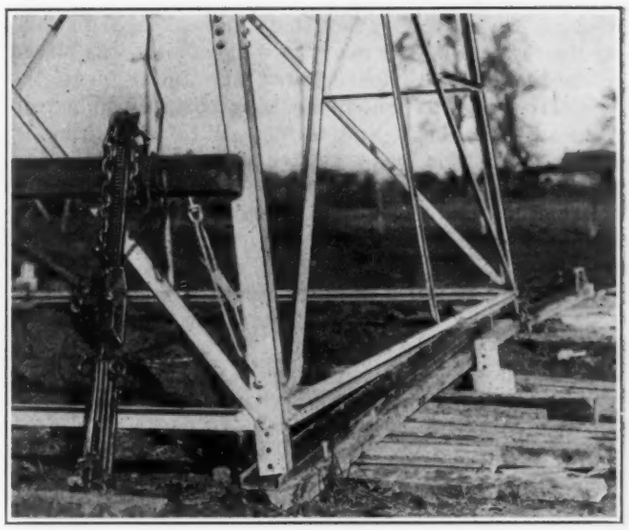


TOWER PREPARATORY TO AND IN PROCESS OF RAISING WITH SHEAR-LEG AND WINCH OPERATED BY CATERPILLAR TRACTOR. THE SHEAR-LEG IS CARRIED BY THE TRACTOR IN MOVING FROM ONE TOWER SITE TO THE NEXT

with respect to the footings when the towers were being erected. While all members were attached to most of the towers before complete erection, it was found that considerable trenching could be eliminated where the footings were below ground level if the cross-webbing was omitted near the base. This was done without endangering the tower during erection.

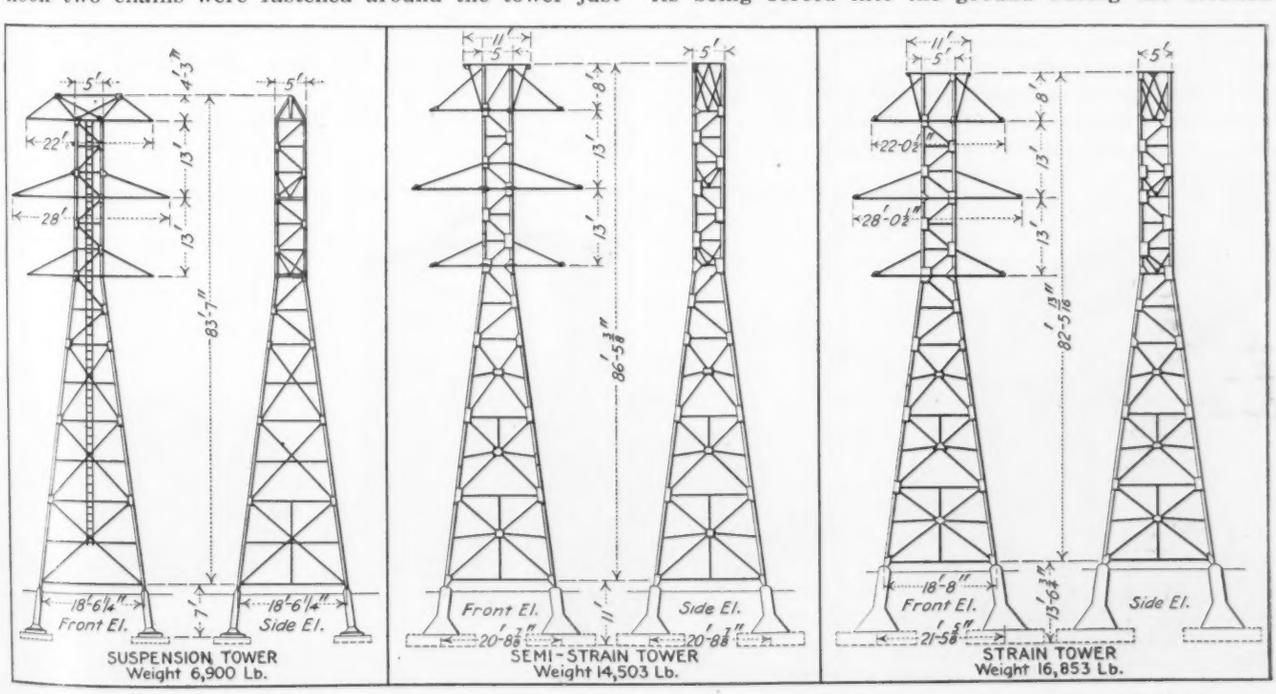
The remainder of the assembly work was allotted to the follow-up crews. These crews needed, as pointed out before, slightly different qualifications. They had to work in elevated positions after the hinged side was raised in the proper relative position to the remainder of the tower. Because of the smaller amount of work which they had to do, these crews were smaller in number. At first the bracing which connected the hinged side to that on the ground was omitted, but eventually it was loosely attached to the hinged section and left free at the other end for the follow-up crew to attach permanently. Each crew carried two wooden gin poles and tackle, which were used to elevate the upper side and hold it while the members were bolted in place. The crew finished inserting all members and permanently fastened all bolts.

Erection of the tower was performed entirely by one crew equipped with a structural-steel shear-leg carried and operated by a caterpillar tractor. As shown by one of the accompanying illustrations, the boom had a hinged structural-steel support (shear-leg) which was hooked back onto the boom while the caterpillar tractor was in motion, but could be let down onto the ground to support the upper end of the boom when the tower was being erected. Loaded with this heavy structural-steel boom and pulling a stone-boat trailer carrying tackle, guys, etc., the tractor could travel over every type of terrain encountered without stalling and could even pass under transmission lines by lowering the shear-leg. While the tractor was moving from one tower site to the next members of the erection crew went ahead and fastened back, side and head guys onto the tower to be erected. For attaching the hoisting hook two chains were fastened around the tower just below the lower cross-arm and joined by a clevis to which the hoisting hook could be attached. Where the tower had to be offset from its center line to permit erecting, a 10-in. x 10-in. timber was lashed across the extreme ends of two legs (those lying on the ground) and back-guyed to serve as a hinge on which to turn the tower in erection. Where the tower legs were to be hinged to the tower footings, plates were attached to the legs and one bolt was run through them and the footings. To brace the footings they were back-guyed and timbers placed between the hinged footings and the other footings for additional support. When the tractor carrying the shear-leg came up to a tower site, a wooden platform carried by the trailer was taken off and placed under one end of the shear-leg to prevent its being forced into the ground during the erection



HANDLING SPECIAL CONDITIONS

Where towers could not be hinged at footing and raised directly into position, as happened where the towers were too close to an adjacent transmission line, they were erected into offset position from center line of foundations and were later slid into position on channel irons by means of stone jacks, block and tackle, etc.



TYPES OF TOWERS ERECTED BY THE SHEAR-LEG METHOD. AT LEFT, SUSPENSION TOWER; IN CENTER, SEMI-STRAIN; AT RIGHT, DEAD-END TOWER

process. Owing to the fact that the hook used in raising the tower was very heavy, a wooden slide was placed in an inclined position against the tower near the lower cross-arm on which the hook could be pulled up by means of a block and tackle. With everything in readiness, erection was a matter of only a few minutes, the winch on the caterpillar tractor being used for the hoisting power. After the tower was erected it was either bolted or guyed in position, depending on whether it was erected directly on the footings or offset from the center. In the latter case the final operation of moving the tower over onto the footings was deferred.

Shift-over crews were used only where towers were so close to the existing lines that they could not be hinged on the footings and raised. In such cases channel irons with their ends slotted to fit around the tower footings were placed next to each tower leg. The shift-over crew jacked the tower legs into these channels on top of greased blocks by means of stone jacks (see illustration). Then the tower was slid along the channels to the tower footings and jacked into place again, block and tackle or stone jacks being used for this operation also.

The execution of this work was carried on under John Wynn, construction foreman, and W. H. Kuntz, district engineer.

Motion Pictures of Power Plant Construction

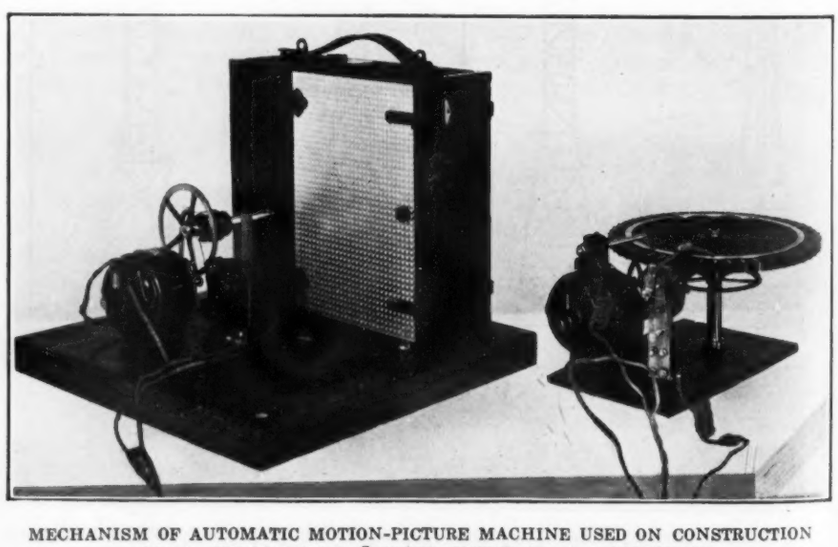
Permanent Record of Construction Secured — Films Used to Aid Security Sales to Customers and to Interest Stockholders

FOR recording progress in the construction of its Big Creek No. 3 power house, while being erected, the Southern California Edison Company used an automatically operated motion-picture camera. The camera was motor driven and the mechanism so arranged that exposures could be made at intervals of from two minutes to two hours throughout the day. Essentially the device consists of a motor-driven contactor and a motor for cranking the motion-picture camera, both of which are shown in the accompanying photograph. The contactor is so designed that a reduction in speed is made from the motor to the contact-making mechanism by means of worm and spur gears. The intervals between exposures depend upon the speed of a small series motor. The motor which operates the contact-making disk runs continuously from the time it is started in the morning until it is shut down at night. When the circuit to the large motor operating the camera crank is closed through the contact disk the mechanism of the camera is turned just enough to make two exposures or frames. Two exposures are made so there will be greater certainty of obtaining a good picture at this moment.

The camera and contact-making device was mounted in the small shack shown in one of the accompanying pictures located on the hillside on the opposite side of the river from the power house. Normally the machine was adjusted so that an exposure was made every two minutes. The result is nothing more than a series of disconnected photographs on a strip of motion-picture film, but when this film is run through a projection machine operating at the normal speed of sixteen exposures a second the power house is seen to rise rapidly. The camera was kept in its described location until the building was completed so that the film would show the work from the sluicing for the foundation to the completion of the structure. In like manner pictures were taken showing the assembling of the machinery in the plant. Thus the construction of a large hydro-electric power plant was shown in an interesting manner. The films will be valuable as records for future reference and in addition may be shown to the public to stimulate interest in the company's securities. Showings already made indicate that the completed pictures are very satisfactory.

This application has an added advantage for it records conditions during construction so that accidents if any can be definitely analyzed and recorded. Much interest has been excited by the films shown and the art of motion pictures added to that of airplane views places a real asset in the hands of central-station executives whose power houses are located many miles from densely populated communities. Many other uses of these construction films can be outlined and the success of the initial work encourages the company to continue the plan.

BUILDING IN A GOOD PHOTOGRAPHIC LOCATION HOUSES AUTOMATIC MOTION-PICTURE MACHINE



MECHANISM OF AUTOMATIC MOTION-PICTURE MACHINE USED ON CONSTRUCTION JOB AT BIG CREEK NO. 3 POWER HOUSE OF THE SOUTHERN CALIFORNIA EDISON COMPANY

Swedish Methods of Impregnating Poles

New Method Involves Charring the Pole and Then Treating It with Creosote—The Relation Between Value of Increased Life and Cost of Impregnation—Details of Processes Used in Sweden and Conclusions as to Best Methods

By EINAR HEDENLUND
Electrical Engineer, Stockholm, Sweden

THE desire to lengthen the span of usefulness of poles employed for telegraph and high-tension lines and other outside timber structures has brought out many methods of wood conservation. The method to be described here has been in use for the last three years, being first tried out and employed in Sweden and later used to great advantage in Norway, Denmark and Finland. In spite of these countries having an ample supply of wood at a moderate cost, the question of conservation has none the less been prominently to the fore for many years past. In the United States and Canada, where forest economies of every kind are now receiving much attention, the problem should be of equal interest, and the good results won in the Scandinavian countries in the war waged against the dry-rot-producing fungi are worth knowing.

The mycelia, or cellular filamentous spawn of the fungi, which produce dry rot in wood, require for their existence and growth a suitable degree of moisture and access to the oxygen of the air. Their maximum development takes place at 18 per cent of moisture in the wood, and the growth decreases at both a higher and a lower degree of moisture. It goes without saying that the favorable degree of moisture must be present during a certain length of time if the fungi are to have an opportunity to attack the wood. Experience teaches that a telegraph or other pole is always broken off at the ground level. When the part of the pole in the air is exposed to rain the moisture at the surface is considerably higher than 18 per cent, but it soon dries and the moisture in the wood falls considerably below that percentage. The period during which the moisture is favorable to the development of the fungi is in fact too brief to give it any real power of life and growth. It is quite different at the point where the pole enters the ground; there the moisture is retained for a much longer period, and it is there where the depredation of the fungi is most in evidence. If one examines a pole which has been in use a few years, it is easily ascertained that the rot is not so much on the surface as further in the wood. The reason for this behavior is that the moisture is retained the longest in the deepest recesses formed by the cracks, and from this vantage ground the fungi spread through the outer portions of the wood and convert its cellular structures. The heart of the wood is provided by nature with resinous substances for resisting those depredations, and the rot is therefore confined to the outer wood. This disposition is rather unfortunate in the present case, however, as it is the outer portion of the pole which is subjected to the severest mechanical stresses. It is of interest to note in this connection that when the earth is packed round the pole up to the ground level the principal place of attack is exactly at that point, whereas if the pole is packed around with stones, the attack is made at two points, about 15 cm. above and below the ground level.

CHARRING POLES PREPARATORY TO TREATING

The foregoing makes it clear that the impregnation should in the first place be concentrated at the point where the pole enters the ground, or, in general, at places where the wood retains a constant degree of moisture, as, for example, the top surface of a horizontal piece of timber having deep cracks filled in rainy weather with water which later penetrates into the wood.

The remedy against dry-rot fungi is impregnation of the wood. What constitutes, then, a satisfactory method of impregnation?

It is of importance in the first place that an impregnation compound with highly disinfective properties be chosen and one having no injurious chemical effect on the wood. As creosote oil has proved to be everything that is desirable for this purpose, the matter may be regarded as settled. It is merely necessary to point out that creosote as impregnation fluid allows moisture to enter and pass out of the wood without losing its protective properties, being soluble only with great difficulty in water. It is fatty and contains phenols and volatile carbo-hydrates.

Not less important than the nature of the impregnation compound is the method of applying it on the wood. As stated previously, it is of fundamental importance that the treatment shall extend to the very bottom of the cracks, seeing that this is the spot where the fungi are developed and attack the wood. If this condition is fulfilled, the entire base of operation of the fungi is destroyed, and an attack by them is not possible so long as the poison is present. The following description of the new method will show in how far the above conditions are compiled with.

Some older methods still in use in Scandinavian countries will first be lightly touched on.

Tarring of the earth end of the pole is practiced too frequently to be passed over. This method is very

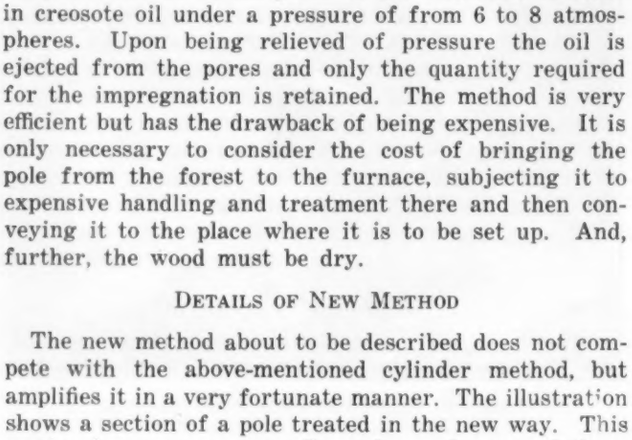
unsuitable, the tar merely covering up the surface of the cracks. Water entering a crack extending above the ground level is thus prevented from leaving the crack, and the tarring has served to give the fungi increased facilities for attacking the wood. A tarred pole is, as a matter of fact, more quickly destroyed than one not treated at all.

Copper sulphate is still used to some small extent and should therefore be mentioned. The method appears to be on the point of being given up, however, because copper sulphate has proved insufficiently effective as a disinfectant.

Creosote treatment in closed impregnating cylinders is based on the principle applied by Ruping, viz., to compress the air in the pores of the wood and to force in creosote oil under a pressure of from 6 to 8 atmospheres. Upon being relieved of pressure the oil is ejected from the pores and only the quantity required for the impregnation is retained. The method is very efficient but has the drawback of being expensive. It is only necessary to consider the cost of bringing the pole from the forest to the furnace, subjecting it to expensive handling and treatment there and then conveying it to the place where it is to be set up. And, further, the wood must be dry.

DETAILS OF NEW METHOD

The new method about to be described does not compete with the above-mentioned cylinder method, but amplifies it in a very fortunate manner. The illustration shows a section of a pole treated in the new way. This section has numerous small cracks, and some of these are deep. There are cracks with an opening only 0.2 mm. wide at the surface of the pole and yet several centimeters deep. In spite of this the poles are impregnated all the way down to the bottom of the crack. This method was the outcome of a thorough investigation

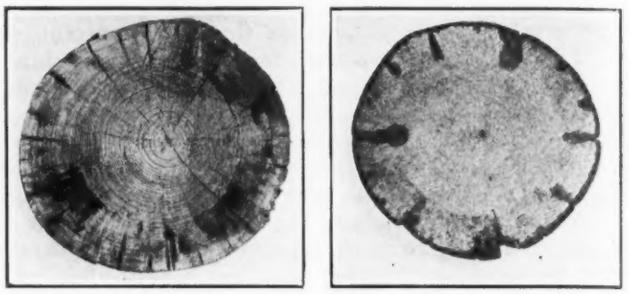


SPRAYING POLES AFTER CHARRING

made at the suggestion of the Royal Swedish Waterfalls Administration into all the factors involved in pole treating.

When treated in a cylinder the wood must be dry, but in the case to be described it must be assumed that the wood is fresh. If a pole is treated, say, in the spring, it is possible to impregnate the entire "danger zone" satisfactorily for the time being; but the pole dries up during the summer, new cracks being formed and the older ones widened. This would give the fungi a chance to attack the wood in spite of the impregnation, and the labor expended would be in part futile. To provide against this the poles must be first charred by means of a specially designed pole-charring appliance.

It has been known a very long time that merely charring the poles is a good way to make them more durable. This is due to the fact that the dry-rot fungi obtain no nourishment from the charcoal on the surface



AT LEFT, SECTION SHOWING THAT POLE ROT IS BENEATH THE SURFACE. AT RIGHT, POLE SECTION SHOWING NEW TREATMENT, CRACKS COMPLETELY IMPREGNATED

of the wood. There is not sufficient protection for the walls of the cracks, however, where no charcoal is formed during the burning. What is gained is that new cracks are formed at the charring and the existing ones are opened up to the greatest possible extent. When the poles are sprayed after the charring the cracks are in consequence impregnated all the way down. The treatment just described has opened the cracks so wide that the warmth of the sun will not open them any wider. On the contrary, they gradually close up. Furthermore, charcoal, being a porous substance, absorbs even more of the creosote than the wood can do, and this excess quantity is later given off to the wood, amounting in fact to a subsequent impregnation.

It is now about four years since the author started to use this method as superintendent of lines of the Alvkarleby Power Works of the Royal Swedish Waterfalls Administration. All wooden power lines belonging to the administration now are impregnated in this way, and the manufacturer of the apparatus, A/B. Furnos, Stockholm, has been successful in introducing the method into common use, it being universally recognized as adopted for telegraph lines, power lines and railways in Sweden as well as in Norway, Denmark and Finland.

COST OF TREATMENT

It is most pertinent in discussing wood preservation to arrive at some measure of the actual cost or economy of the treatment. In other words, by what length of time has the life of a pole to be increased to get back the cost of impregnation? Mr. Fougner, technical manager of the Svaelgfors Power Works, belonging to the Norsk Hydro Company, Norway, who has had several years' experience in the use of this method of impregnation, recently suggested the following formula for the relation of cost of impregnation to increase of life of pole:

$$i/u(g + t) = k/gt,$$

where i = cost of impregnation, u = the interval of impregnations, g = duration of life of pole not im-

pregnated, t = the increased duration of life of pole impregnated, and k = cost of exchange of a pole.

Solving this equation gives:

$$t = igg \div (kn - ig).$$

As an example, if $i = 1.50$ crowns, $n =$ five years, $g =$ ten years and $k = 25$ crowns (figures taken from practice in Sweden), then

$$t = 150 \div 110 = 1.4 \text{ years.}$$

If after impregnation every five years the pole stands one year and five months longer than unimpregnated poles, all the costs are paid. As a matter of fact, it is usual to count on an increased duration of life of five years, this giving a net saving of three and one-half years per pole. Every one knows his own conditions and can figure the economy on his own poles. The duration of life for an unpregnated pole is, of course, very different according to whether the pole stands in sand, loam or other soil.

The cost of impregnation per pole by this method in Sweden is estimated as follows:

	Crowns
2 kg. (½ gal.) creosote oil	0.54
1 kg. (¼ gal.) paraffine oil	0.15
Labor (four men can impregnate at least forty poles in eight hours), at 7 crowns a day per man	0.70
Transport, etc.	0.11
Total	1.50

Legislation and Court Decisions that Threaten Utilities

IN HIS address before the recent convention of the Great Lakes Division, N. E. L. A., Carl Jackson, the general counsel of the association, dwelt, as the ELECTRICAL WORLD reported at the time, on the importance of much precedent-forming legislation and many court decisions affecting utility companies not only to the companies immediately affected but also to others, in whatever state they may be established.

Mr. Jackson referred particularly to the Bluefield Waterworks, the Georgia Railway & Power and the Southwestern Bell Telephone cases in the United States Supreme Court and to two railroad cases which came up under the Interstate Commerce Commission transportation act. He pointed out that Judge Brandeis has recorded the dissenting opinion that the property which is protected by the United States is not the property which is used in rendering service but the investment therein. If this principle be applied, property can be appraised on the basis of the original investment, Mr. Jackson said. In most cases the courts have held that the value for rate-making purposes differs considerably from that for other purposes like condemnation.

In another case cited by Mr. Jackson the court ruled that inasmuch as it had valued units of property of a going concern, no further consideration of going value would be entertained. This and similar decisions are an utter discouragement to efficient operation, Mr. Jackson contended.

An extreme case affecting a railroad was cited in which the Interstate Commerce Commission applied the depreciation theory to property before the plant could even be put in operation and in which an accounting method was ordered diametrically opposed to that prescribed by the N. E. L. A. and to the systems used in twenty states of the Union. Mr. Jackson said this ruling might be extended to an electric utility system owned by a railroad or even to one distributing power from a plant so operated.

They Admit It, Nevertheless

"A Traveler's View of Electrical England"

An Editorial from a Recent Issue of "Electrical Times" (London)

OFTEN, when reading a traveler's description of a foreign country in which he has made a short stay, we have wondered how it would strike an educated native. However conscientious the traveler, his facts must be incomplete, his perspective distorted, his inferences out of phase. Even if he escape the besetting sin of travelers, namely to regard himself as of a higher order than the "natives," whoever they may be, he may, with the best intentions, give wrong impressions to the readers of his own race. The "native" reader also receives a wrong impression, but in another way. He feels that he is being exhibited like an insect under a microscope and compelled to hear his imperfections imperfectly described by a being who is complacently conscious of his own superiority.

And that is just the impression conveyed by a recent article* in our esteemed contemporary, the ELECTRICAL WORLD. The editor, W. H. Onken, Jr., has visited a foreign country; he has collected facts, and the result is an article entitled "Electrical Development in England," illustrated with pictures of street lighting in London, from which the less instructed of his fellow countrymen will gather that gas is the only illuminant and that the word "development" is "rote sarkastikul." Surely this is out of focus:

> For it would appear, with evidence of gas lighting on all sides (and excellent gas lighting it is), that electricity is almost, but not quite, as unknown in Great Britain as the Christian's God was in ancient Athens.

We do assure Mr. Onken, with tears in our eyes, that comparatively few modern Britons still go about in woad, and that although the Ancient Order of Druids continues to flourish, human sacrifices are on the decrease.

Our visitor ascribes much of our backwardness, which we freely admit, to the act of 1882, and this is true enough. But he has no good word to say for municipal enterprise. Granted that the system of small areas is bad, it is none the less true that in this country the average municipal undertaking displays more initiative, grows more rapidly and sells cheaper current than the average company. The statement that we lack standardization because the industry itself has shown no interest in the matter is just the sort of generalization to which travelers are prone.

To Mr. Onken's catalog of our handicaps we could add a few of importance. One is of forty years' standing. We have had from the first to contend with fierce and bitter competition from the cheapest, most efficient and most comprehensive gas supply in the world. Again, since 1914 we have suffered an incalculable loss of resources, both human and material, owing to the war. Our surviving citizens, instead of being able to spend their bank overdrafts on electrical conveniences, have all their work cut out to satisfy the insatiable maw of the tax gatherer. And, thirdly, we suffer from a lamentable lack of organization and co-operation, not only within most sections of the industry, but between the various sections. This last is entirely our own fault, but the other two are our misfortune.

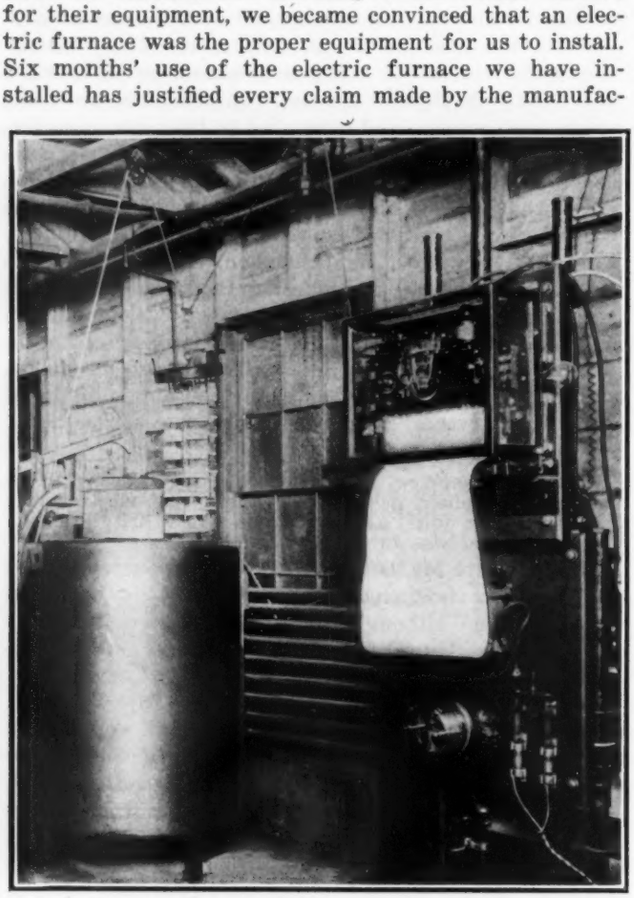
*Nov. 24, 1923, page 1055.

Electric Furnace Proves Best

Special Application for Hardening Clipper Plates Proves Very Economical—Costs and Operating Results

BY JOHN WATSON
President Coates-Clipper Manufacturing Company, Worcester, Mass.

DIFFICULTIES in obtaining uniform results in our heat-treating department made us consider an electric furnace for hardening clipper plates. On discussing our problems with different manufacturers of electrical furnaces and listening to the results claimed for their equipment, we became convinced that an electric furnace was the proper equipment for us to install. Six months' use of the electric furnace we have installed has justified every claim made by the manufacturer and, in fact, has exceeded the expectations which influenced us to purchase the furnace.



VIEW OF FURNACE AND CONTROL PANEL

We are using a vertical cylindrical type of furnace made by the General Electric Company. The heating chamber is 10 in. in diameter and 21 in. deep and is rated at 10 kw. on 110 volts, single-phase, 60-cycle current. The furnace is well insulated with heat-insulating material and provided with a top which fits on tightly and which can be lifted off and swung to one side, allowing easy charging and discharging. The resistor coils are of heavy nickel chromium ribbon and are arranged around the chamber of the furnace, thus insuring a direct absorption of the heat by the charge to be heat-treated. Automatic control is provided by a control panel placed in one corner of the room and out of the way. On this panel is mounted a recording controller which gives us a graphic record of each charge heat-treated and which also gives us the critical point in the steel we are using. A thermocouple located in the furnace is connected to the recording controller, and we have found this control equipment to be entirely reliable and easy to adjust.

8,000 MORE PLATES BY ELECTRICITY THAN BY GAS

With the gas furnace we were able to heat-treat a maximum of 1,600 small plates a day. With our electric furnace we have a capacity of 9,600 small plates per day of eight hours. This means an increase of six times in our production. Only one operator is required in each case, thus insuring a direct saving of five days' labor in each week from the operation of our furnace. The furnace operator is thus released for other productive work around the plant, and we gain this five days' productive labor as well as reducing our heat-treating labor cost by five-sixths of the former cost. We have provided a framework on which to hang the clipper plates, and a charge consists of 300 small plates. We get four charges per hour from the furnace, and as it takes three minutes to unload and load, the charge is in the furnace twelve minutes. In our gas furnace we had an average rejection of 10 per cent due to warping and breaking on the small plates. Now we have no rejections. Large plates for horse clippers we formerly heated and quenched between forms to prevent warping. The maximum number of these large plates we could heat-treat per day was 300. Now we have eliminated the forms and we can heat-treat 5,000 per day. Our rejections have been cut from 15 per cent to 3 per cent.

There is no decarbonization and no scale. Formerly we had to scratch-brush our plates, then tampico-brush them before buffing. The electric furnace has eliminated all scratch-brushing.

Our monthly gas bill for heat-treating was from $40 to $45. The cost of operating the electric furnace is 50 per cent of the cost of gas, and the largest monthly bill we have had was $20. It covered the same number of plates that were formerly heat-treated with gas.

CONCLUSIONS

There have been four definite results obtained by using the electric furnace:

1. A reduction of 50 per cent in our fuel cost.
2. Labor cost for heat-treating reduced 83 per cent.
3. Rejection loss cut 100 per cent on small plates and 80 per cent on large plates.
4. Elimination of scratch-brush operation on entire operation.

Any one of these results would justify the purchase of an electric furnace. In addition, we have the gain from the productive labor of our heat-treating operator, who is on other work when not operating the furnace. We have heat-treated some work for other manufacturers, and in every case we have obtained perfect results. For instance, we heated pieces of steel 18 in. long, 4¼ in. wide and 2½ in. thick for a company that had been having trouble due to warping. The pieces were heat-treated with a distortion of less than 0.003 in. over the 18-in. length, and the scleroscope test indicated uniform hardening throughout. Fine results from bluing and drawing have also been obtained from this furnace. The furnace is clean and easy to operate, uniform results are assured, and the working conditions in our heat-treating room are ideal owing to absence of heat loss from the furnace and products of combustion found in fuel-fired furnaces.

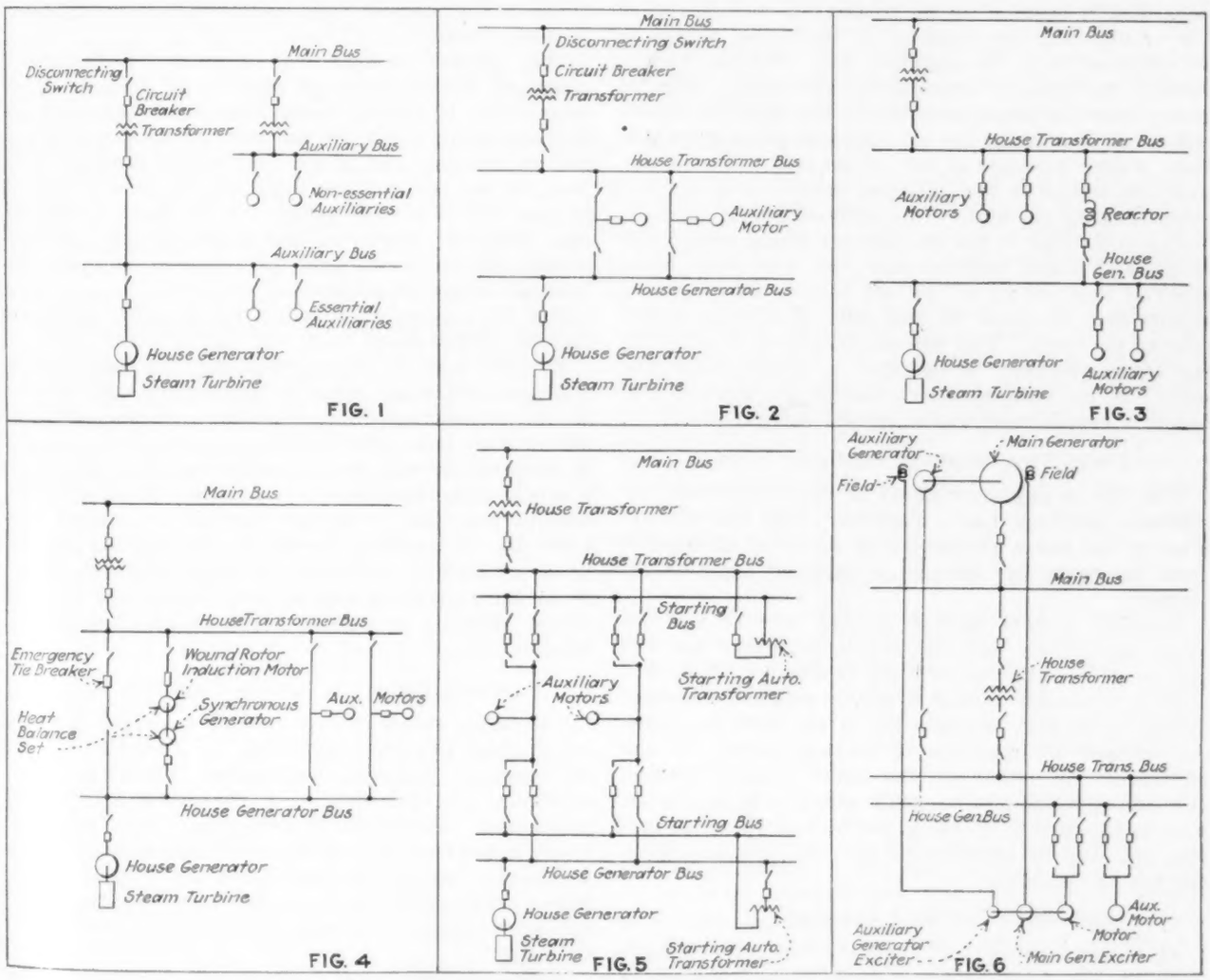
Energy Supply for Station Auxiliaries

Reliable Service Under All Operating Conditions Sought—Effect of Heat Balance and Bleeding on Layouts—Discussion of Systems Proposed and Used

By F. M. BILLHEIMER
General Engineer Westinghouse Electric & Manufacturing Company

THE advent of the auxiliary turbine-driven house generator in the larger stations removed to a considerable extent the difficulty of obtaining a satisfactory source of supply for the auxiliary motors. This is especially true when the auxiliary generator is not operated in parallel with the main bus, and where, in the event that it is paralleled with the main bus, it can be readily disconnected in case of disturbance on the main bus, which carries the station load. The use of a flexible tie between the main bus and the house-generator bus, consisting of a motor-generator set composed of an induction motor with a permanent slip resistance, to drive a synchronous generator has proved very satisfactory.

The use of stage-bleeding turbines, in order that feed water may be heated by steam bled from the main unit, will simplify the problem of obtaining the proper heat balance. At the time the load is heaviest on the main turbo-generator unit the most steam is available for heating the feed water when the greatest amount of feed water is required. The combination of bleeding the main unit to obtain proper heat balance and the use of an alternating-current auxiliary generator



ONE LINE DIAGRAMS OF AUXILIARY POWER LAYOUTS

Fig. 1—A good arrangement for securing heat balance, but objectionable in the event of trouble on the main bus.

Fig. 2—The use of separate buses permits the division of auxiliary motors on the basis of maintaining operation at all times.

Fig. 3—Objection is made to the reactor tie because reactance must be high and this limits energy transfer.

Fig. 4—The motor-generator tie supplies essential auxiliaries if the house generator fails.

Fig. 5—Duplicate breakers make for quicker transfers and ease in repair work on equipment.

Fig. 6—A proposed system where bleeding is used and the house generator is on the shaft of the main unit.

directly connected to the main unit for supplying the essential auxiliaries promises to be very efficient and also to provide means for isolating the auxiliaries from the disturbances on the main bus.

The necessity of obtaining a reliable source of supply for the essential motors in the modern central station has led to the use of a number of different auxiliary bus arrangements.

Some simplified single-line diagrams of auxiliary bus arrangements which have been used and also some which have been contemplated are here given, with a brief discussion of their advantages and disadvantages.

House-Generator Bus in Parallel with Main Bus

With the arrangement in Fig. 1 either of two auxiliary buses may be used, and the essential or more important auxiliary motors may be operated from the auxiliary bus, which is fed directly by the house generator. Proper heat balance may be readily obtained with or without bleeding steam from the main turbine. However, in case of trouble on the main bus the house-generator bus will be affected. The extent to which service on the house-generator bus may be preserved will depend upon the rapidity with which the buses are separated by opening the tie breaker, the seriousness of the trouble and the capacity of the house generator as compared with the auxiliary load. Failure to disconnect the breaker immediately will allow a flow of power from the house generator to the main bus, which will result in reducing the voltage on the house-generator bus. A drop in voltage of only 30 per cent will cause the available torque on the induction motors to be reduced approximately one-half. This reduced torque available for carrying load in the case of centrifugal pumps will be somewhat less objectionable than with some other types of load, owing to the fact that as the induction motors drop in speed the load falls off directly as the cube of the speed. This general arrangement, whereby the house generator is operated in parallel with the main bus, has been used in a number of instances and has to a considerable extent proved satisfactory.

Using Two Separate Auxiliary Buses

With the arrangement shown in Fig. 2 there are two separate auxiliary buses available. One bus is supplied by the house generator and the other is supplied from the main bus through a bank of house transformers.

Auxiliary motors may be divided between the two buses, so that in case of trouble on either bus the motors on the other bus will not be affected. This is a distinct advantage in that it allows sufficient auxiliary motors to be kept in operation at all times to handicap seriously the operation of the main turbine in case of trouble on either of the buses. Heat balance, although probably not so easily obtained as in Fig. 1, may be obtained by bleeding steam from the main turbine unit and by transferring the auxiliary load from one bus to the other.

Double Bus with Reactor Tie

At various times the auxiliary bus arrangement shown in Fig. 3 has been considered. The transformer bus and house-generator bus tied together through a reactor have, upon first thought, been suggested as a means of preventing disturbance to the house-generator bus in case of main bus disturbance and at the same time allowing the main bus and the house-generator bus to be paralleled to secure heat balance. It has also been thought possible to supply the auxiliary motors on the house-generator bus in case the house generator is out of service.

The use of a reactance at this point will minimize disturbances on the house-generator bus in case of trouble on the main bus if the reactance is high enough in value. However, if the reactance is of sufficient value to prevent disturbance to the house-generator bus in case of main bus trouble, it will be too high a value through which to supply the auxiliary motors on the house-generator bus in case the generator should drop out of service.

Assume that a 2,500-kva. 8 per cent impedance, 2,300-volt, three-phase, 60-cycle, 3,600-r.p.m. house generator is used and that there are 1,200 kw. of 80 per cent power factor induction motors on the house-generator bus. Assume also that a house-generator bus voltage of 80 per cent of normal will be available and permissible for supplying these motors in case of trouble with the house generator and that the motors are fully loaded and the power factor does not rise appreciably with the reduced voltage. The rise in load current will be inversely proportional to the decrease in voltage. If the motors are not fully loaded, there will be a rise in power factor.

The reduced voltage will decrease the available torque of the motors to 64 per cent of normal. This means that if normal house-transformer bus voltage is maintained, a reactor having 0.81 ohm per phase and an impedance of 36 per cent on a 1,500-kva., 470-amp., 80 per cent voltage basis may be used to secure 80 per cent of normal voltage on the house-generator bus. However, if the pull-out torque of the auxiliary motors affected is one and three-fourths or twice the full-load torque, this condition will not be serious since 112 to 128 per cent of full-load torque will be available for driving the motor load.

If, with 0.81 ohm impedance for the reactor and 0.17 ohm for the generator, a serious disturbance occurs on the house-transformer bus, the symmetrical root-mean-square value of short-circuit current which could be delivered through the reactor by the house generator would be approximately 1,360 amp. per phase. It will thus be seen that, with the short-circuit current and 1,200 kw. of auxiliary motors to be supplied by the house generator at this time, the house generator would be so much overloaded as to cause its voltage to drop almost instantly to a value which would allow all the auxiliary motors to pull out of step.

Double Bus with Motor-Generator Tie

The sketch shown in Fig. 4 shows a method of operation where two auxiliary buses are available. These two buses are, however, tied together through a motor-generator set consisting of a phase-wound induction motor and a synchronous generator. The induction motor is fed from the house-transformer bus and has a permanent resistor in the secondary circuit which allows a desired slip to be obtained, so that the house-generator bus may be kept at a lower frequency than the main bus.

With a motor-generator set of sufficient capacity to carry all auxiliary motors which will ever be connected to the house-generator bus, it is possible to supply auxiliaries in case the house generator should be out of service.

A resistor to give 5 per cent slip on the induction

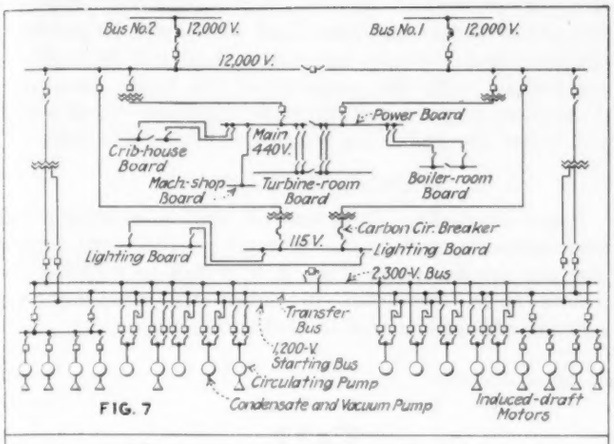


FIG. 7

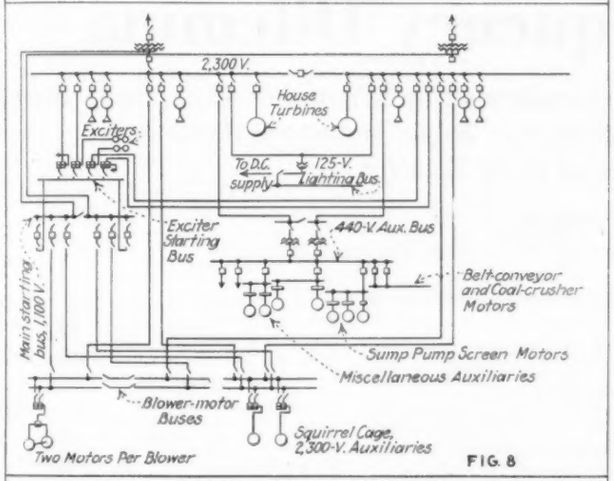


FIG. 8

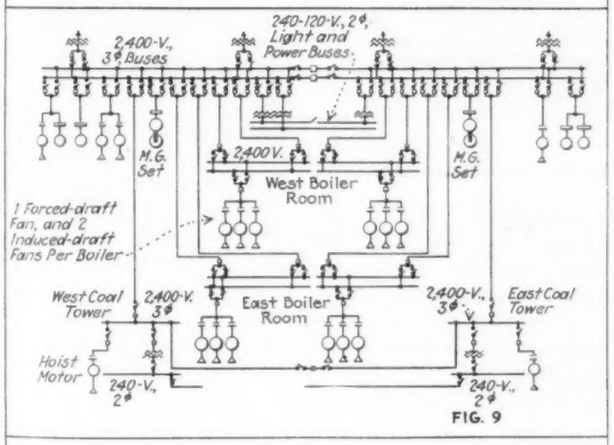


FIG. 9

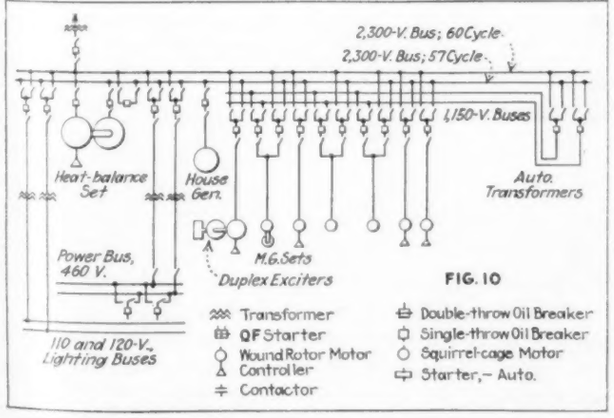


FIG. 10

AUXILIARY POWER LAYOUTS FOR LARGE STEAM STATIONS SHOW GREAT VARIATIONS IN OPINIONS AND PRACTICES

motor will, on a 60-cycle installation, allow the house-generator bus to be operated normally at 57 cycles. Part of the auxiliary motors may be operated from each bus. Proper heat balance may be obtained by varying the speed of the house turbine. For a condition requiring less steam from the house turbine for heating the feed water a part of the load may be transferred to the main bus by adjusting the governor of the house turbine and reducing the speed to the desired value. If it is desired to obtain more steam for heating the feed water, the speed of the turbine may be increased and made to carry more of the auxiliary load. This scheme gives a flexible method of control to maintain the proper heat balance.

In case of disturbance on the main bus a drop in frequency corresponding to the 5 per cent slip of the induction motor will be required to shift the load from the motor-generator heat-balance set to the house turbine. An additional drop in the main bus frequency of 5 per cent will be required to cause the set to operate inverted and transfer the full heat balance rating to the house generator in addition to the auxiliary load on the house-generator bus. It will be noted that only a considerable drop in frequency of the main bus will cause the house-generator bus to be affected. A drop of voltage on the main bus will not disturb the house-generator bus, as it will only be effective in increasing the reactive kva. on the main generator.

Separate Buses with Double Breakers

The arrangement shown in Fig. 5 is the same as that in Fig. 2, except that an additional set of circuit breakers is required. Although this increases the cost of the switch equipment, it allows motors to be transferred more quickly from one bus to another and allows breaker inspection and repairs to be made while the motors are in operation. Either one or two starting buses may be used. In case only one starting bus is used, the starting auto-transformer should have double-throw switching equipment so that it may be connected to either the house transformer or the house-generator bus. In some cases the transferring of the starting auto-transformer from the defective bus to the normal bus is made entirely automatic. The change is made when a reduction in voltage occurs.

Auxiliary Generator on Main Unit

Fig. 6 shows a scheme of auxiliary bus connections where the auxiliary generator bus is supplied from an alternating-current generator which is directly connected to the main generator. Where this arrangement is used, the steam turbines are arranged for bleeding at from two to four points in order to obtain steam for feed water heating.

Automatic Change-Over Control Favored

Some of the large central-station companies which have double auxiliary bus schemes, the same as or similar to those discussed above, consider the importance of keeping the essential auxiliary motors operating at all times to warrant the installation of change-over equipment to transfer automatically the motors from

Fig. 7—An installation that may give trouble if disturbances occur on the main bus.
Fig. 8—An installation that permits a great amount of segregation but requires automatic transfer control for best operation.
Fig. 9—A great number of switches and duplicate buses are used in this installation, but no reserve auxiliary supply is available.
Fig. 10—Typical installation of duplicate auxiliary buses with a motor generator set as a tie connection to insure reliable service.

the disturbed bus to the bus which is unaffected. A high degree of reliability has been gained with this arrangement of having two auxiliary buses available and relay equipment which will select the non-affected bus to supply the motors. Automatic control of this type has been used during the last year or two for circulating and condensate pump motors of the wound-rotor and the squirrel-cage type, and it can reasonably be expected that the use of automatic change-over control will be extended to other essential motors such as those driving exciters, boiler-feed pumps and fans.

It is, of course, necessary in deciding upon the amount of load for auxiliary buses and in the application of automatic change-over equipment that the amount of induction-motor load which will be suddenly thrown upon a house generator shall not be large in comparison with the capacity of the house generator. A serious drop in voltage will otherwise occur which will cause the induction motors to drop their load.

TYPICAL INSTALLATIONS

Some single-line diagrams of station auxiliary bus arrangements now in use in some of the large central stations are shown in Figs. 7, 8, 9 and 10. These diagrams show somewhat in detail the auxiliary bus schemes of stations now in operation.

The Japanese Frequency Dilemma

Interconnection and Superpower Plans in Japan Complicated by Mixture of Equipment Rated at 25, 40, 50 and 60 Cycles in Different Systems—Rapid Industrial Expansion Accentuates Importance of Early Solution

By MINORU FUKUDA
Chief Engineer Tokyo Electric Power Company, Ltd., Tokyo, Japan

AN EXTENDED article on this subject was originally written in Japanese by Mr. Fukuda for the Japanese press for the purpose of bringing home to the Japanese public the importance of unifying frequencies. This article was prepared by him in English for American readers, to whom it may have some interest and to whom the Japanese electrical industry looks for assistance and guidance in finding the solution to its problem. It is also, as Mr. Fukuda states, of importance for manufacturing companies in other countries to know the present situation and problems in connection with their business of furnishing electrical equipment to Japan.

JAPAN today faces an engineering economic problem of the first magnitude as a preliminary or first step in the development of any superpower system or of any general interconnection development. This article can only state the problem. The solution is one in which many agencies will have to take a constructive part.

As soon as the great war was over the leading nations of the world began, without exception, to turn their best energy and effort into the field of commerce and industry, with a view to increase their economic potentialities and promote their national wealth. Of the many problems thus faced the questions of industrial efficiency and fuels have become the focus of attention and close study in every country, as on their solution the welfare of all nations is considered to depend.

As in other countries so also in Japan electrification has served to aid in this problem. Industry was the first to be electrified; then came the electrification of railways and finally of the "home." The next thing coming is the achievement of a superpower system. At the present rate of progress it is hard to imagine how far the utilization of electriciy in industry and in our daily life will eventually go. The remarkable progress achieved in recent years by the electric industry of Japan has greatly increased its power of production, the result of which is that it is now able to serve an ever larger population. And to operate with greatest economy and dependability, Japan, too, must be able to capitalize on the accomplishments of modern electrical engineering which have made possible the economical transmission of electrical energy over a long distance and also the interconnection of electric systems widely scattered and isolated.

But in Japan the necessary unification of frequencies is a first problem. The frequency changer, while useful for this purpose on small systems, is eliminated from consideration for general interconnection on account of its limited capacity. Furthermore, there are also lost all the advantages of a unified system in the way of having prime movers, generators, transformers, motors and all other equipment of a general standard with resultant economies. There is no small cause for concern in Japan, as will be seen by the accompanying data. Table I shows the total amount of generator capacity installed by electrical enterprises both of class A and class B and also by the government, classified under different frequencies as they stood at the end of 1913, 1917 and 1919.

TABLE I—INSTALLED GENERATOR CAPACITY IN JAPAN (IN KW.) CLASSIFIED BY FREQUENCIES

No. of Cycles	1913	1917	1919
25	39,527	75,822	53,702
30	5,590	4,375	5,115
40	9,580	12,305	23,725
50	116,955	289,522	386,512
60	136,503	296,548	428,901
80	278	178	93
100	365	149	70
120	90	.....	.....
125	1,218	94	.....
133	555	250	.....

Class A indicates those electric companies which sell electric service directly to the general public. In class B are included those electric companies or individuals that sell electricity by wholesale only to companies of class A or generate electricity for their own use, neither being legally permitted to deal directly with the general public.

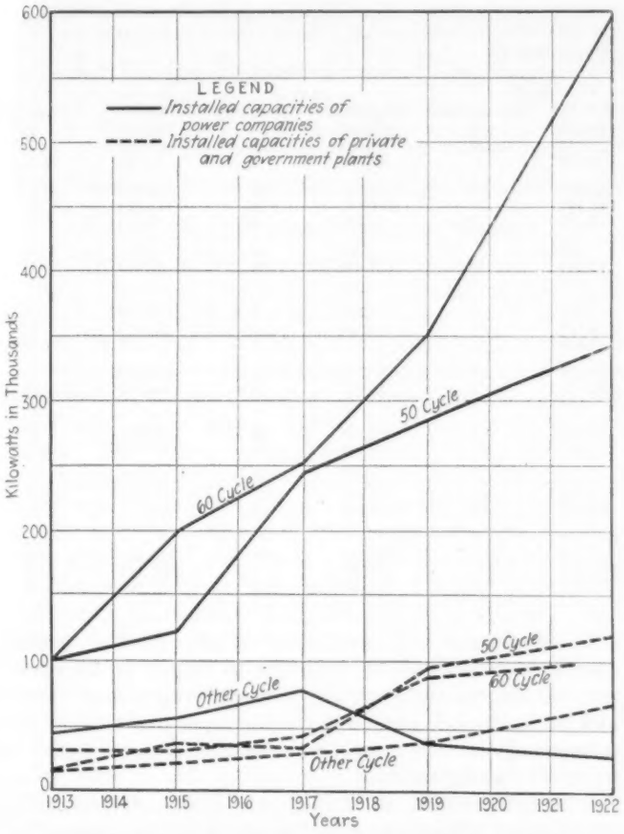


FIG. 1—INSTALLED CAPACITIES OF DIFFERENT FREQUENCIES OF POWER COMPANIES AND GOVERNMENT PLANTS

NOTE—The amounts of power and different frequencies used for the various years are based on data taken as follows: 1913 data were taken August, 1913; 1915 data were taken May, 1914; 1917 data were taken June, 1916; 1919 data were taken August, 1918; 1922 data were taken June, 1922. The numbers of kilowatts indicate the total installed capacities at the different frequencies.

Government works are those factories owned by the states for various industrial purposes.

According to Table I, the frequencies in Japan are 25, 30, 40, 50, 60, 80 and 100 cycles. Among them 60, 50 and 25 cycles have the greatest volume of kilowatts, or, more precisely speaking, 60 and 50 cycles lead in volume and 25 cycles comes next to them. Up to 1913 there were, as shown in Table 1, 120, 125 and 133 cycles, but they gradually disappeared thereafter.

In Table II is shown the total kilowatts installed by electric companies of class A, and in Table III the total installed by companies of class B, including government works. Both tables are classified according to the cycles used—50, 60 and so on—and geographical districts in the years 1913, 1915, 1917, 1919 and 1922 (June).

As seen from the tables and charts, 60 cycles is more common than any other frequency in virtually all districts other than Tokyo. Judging from the trend of the past ten years, it seems plausible to conclude that the future trend in frequency will be toward 60 cycles as in the past. But such is the situation as it stands today. The next stage is superpower and interconnection, and whether 50 cycles or 60 cycles will be the predominant or base frequency must be determined on the merits of the qustion.

Comparing 50 cycles and 60 cycles, the following points are to be noted:

1. *Generators.*—The size or the weight of the generator is smaller, and accordingly its price is lower, at the higher frequency.

2. *Transformers.*—What has been said in regard to generators applies unqualifiedly to transformers. Voltage regulation, too, is better with the higher frequency.

3. *Transmission Lines.*—Considering the transmission line by itself at the higher frequencies, there is the disadvantage of a poor voltage regulation. But in transmitting a great volume of electrical energy at extra-high tension over a long distance synchronous con-

FIG. 2—MAP OF JAPAN SHOWING THE RELATIVE DISTRIBUTION OF THE DIFFERENT FREQUENCIES AS THEY NOW EXIST IN DIFFERENT LOCALITIES

NOTE—The map shows the percentages of the installed capacities of different frequencies and the figures were taken at the end of June, 1922.

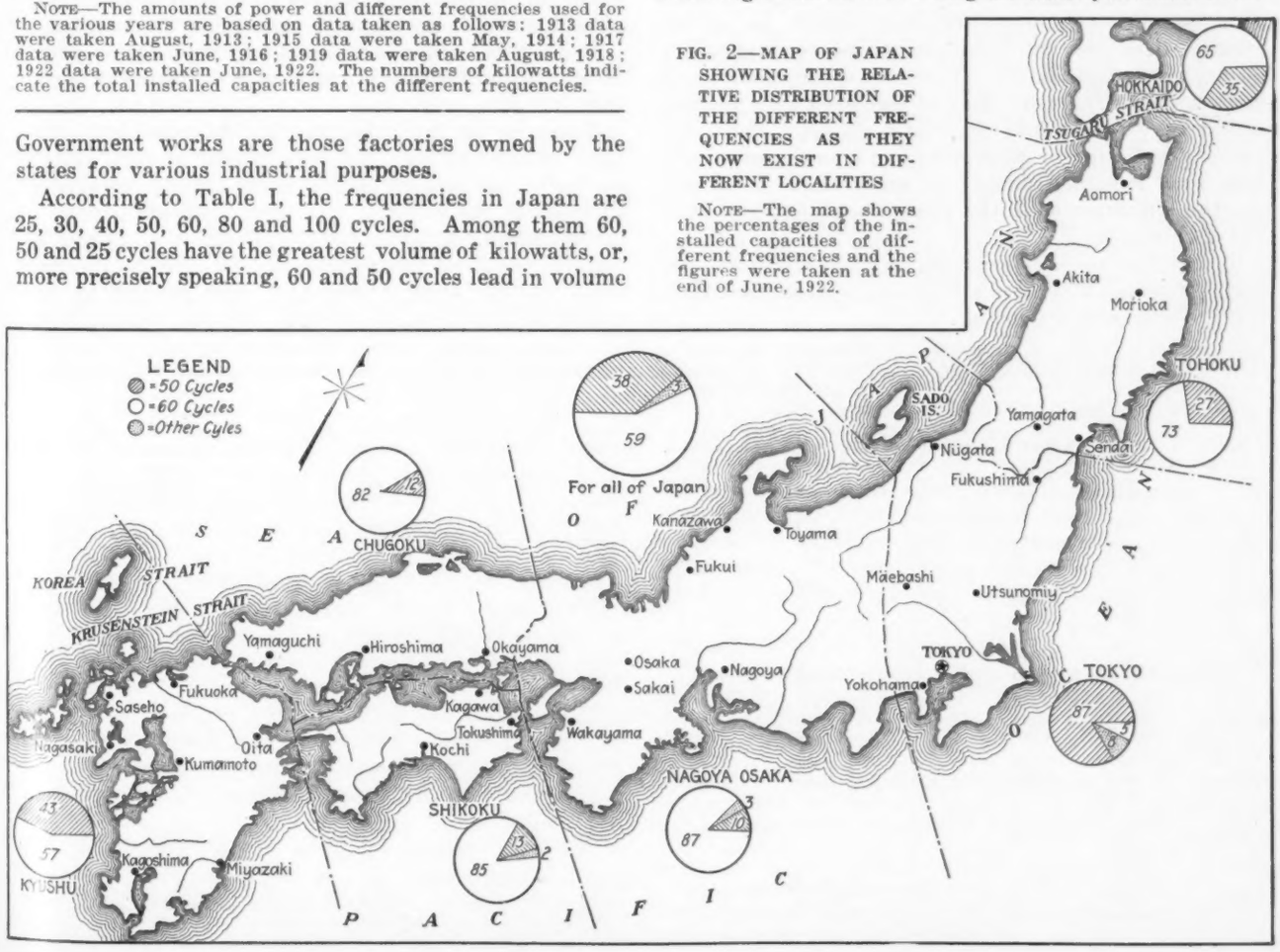


TABLE II—(CLASS A)—INSTALLED GENERATOR CAPACITY AND NUMBER OF OPERATING COMPANIES, CLASSIFIED BY FREQUENCY AND IN DISTRICTS

District	Cycles	1913 Kilowatts	1913 Enterprises	1915 Kilowatts	1915 Enterprises	1917 Kilowatts	1917 Enterprises	1919 Kilowatts	1919 Enterprises	1922 Kilowatts	1922 Enterprises
Tokyo	50	73,566	20	80,903	34	178,150	34	202,085	33	226,814	40
	60	11,168	18	11,723	25	5,142	17	4,608	13	11,756	6
	others	21,703	7	36,352	7	50,920	6	29,083	5	20,893	4
Osaka and Nagoya	50	8,602	17	14,155	35	16,449	39	20,721	52	38,442	71
	60	41,810	22	125,775	80	142,343	93	213,172	93	338,219	112
	others	19,580	8	17,140	12	18,735	7	12,430	5	10,912	4
Chugoku	50	972	12	1,247	16	2,867	16	6,264	14	5,011	9
	60	9,223	22	9,984	29	12,019	35	16,446	31	37,921	26
	others	169	3	169	2	109	2	.....	..	.....	..
Shikoku	50	950	4	1,900	5	2,044	6	1,905	8	3,153	10
	60	6,450	6	6,662	8	8,724	15	11,624	15	20,369	13
	others	247	1	537	1	537	1	587	2	537	1
Kyushu	50	11,330	17	22,015	17	38,268	19	45,740	19	63,450	30
	60	11,825	27	18,756	16	32,686	22	37,857	18	86,020	23
	others	1,269	8	1,210	6	139	3	.....	..	.....	..
Tohoku	50	4,495	13	6,588	19	9,291	39	12,245	46	27,097	67
	60	11,220	25	12,877	29	26,003	36	29,345	33	73,288	37
	others	90	1	120	1	.....	..	.....	..	.....	..
Hokkaido	50	70	1	75	1	484	12	1,679	27	20,501	31
	60	13,625	9	14,830	9	23,303	13	26,217	16	38,138	15
	others	.....	..	.....	..	.....	..	.....	..	.....	..
Total	50	99,985	84	126,893	127	247,553	165	290,639	199	384,466	258
	60	105,327	129	200,607	196	250,222	231	339,269	219	605,711	232
	others	43,058	28	55,529	29	70,400	19	42,100	12	32,342	9

densers may be used not only to overcome this shortcoming, but in addition greatly to improve the regulation. Furthermore, the damage caused by the short circuit of the transmission line is less extensive with the higher frequency. The corona is more severe at higher frequency, but in the transmission of a great volume of electrical energy, where the transmission wires are of large size on account of current capacity or mechanical strength, the question of frequency as regards corona is of slight importance.

4. *Induction Motors.*—For high speed, as in the smaller sizes used in industrial purposes, higher frequency is better suited. For low speed, with large motors, either frequency may be employed with no great difference. As regards price and efficiency, what has been said relating to generators and transformers holds true with induction motors as well. There is no substantial difference as to the power factor between these two frequencies.

5. *Synchronous Motors.*—As with generators, the higher frequency is more advantageous from the standpoint of efficiency and price.

6. *Synchronous Converters.*—While in the earlier stages of technical development 15 cycles or 25 cycles was considered the best, the present progress of design has made 50-cycle and 60-cycle machines practicable. On comparing 50 cycles and 60 cycles the latter is found to be by no means inferior.

7. *Electrification of Railways.*—Since electrification of railways, either by direct current or by alternating current, is merely a combination of all the equipments above mentioned, 60 cycles can be said to be much more advantageous in all respects than other frequencies.

8. *Lighting and Electrification of Residences.*—There is not much difference between 50 cycles and 60 cycles in this instance.

Summing up, it is apparent that 60 cycles has advantages over 50 cycles. But, as a matter of fact, systems of both frequencies are already firmly established throughout the country, and their unification must be accomplished only after full consideration of all economical and technical viewpoints. In any case the reformer must possess great firmness of will as well as rare ability in finance to execute this gigantic undertaking.

TABLE III—(CLASS B, INCLUDING GOVERNMENT)—INSTALLED GENERATOR CAPACITY AND NUMBER OF OPERATING COMPANIES, CLASSIFIED BY FREQUENCY AND IN DISTRICTS

District	Cycles	1913 Kilowatts	1913 Enterprises	1915 Kilowatts	1915 Enterprises	1917 Kilowatts	1917 Enterprises	1919 Kilowatts	1919 Enterprises	1922 Kilowatts	1922 Enterprises
Tokyo	50	7,825	6	14,575	4	9,623	2	11,916	2	14,844	6
	60	5,920	10	7,323	3	7,275	3	10,940	4	11,070	4
	others	2,000	1	2,000	1	4,365	1	6,365	2	6,365	2
Osaka and Nagoya	50	.....	..	5,753	4	9,200	6	11,025	10	21,323	13
	60	6,835	13	8,330	11	14,025	13	39,689	27	51,760	40
	others	55	1	.....	..	2,000	1	.....	..	.....	..
Chugoku	50	.....	..	800	1	800	1	1,600	2	2,900	3
	60	900	2	.....	..	2,000	1	6,070	5	4,670	4
	others	.....	..	.....	..	.....	..	.....	..	.....	..
Shikoku	50	.....	..	.....	..	.....	..	1,650	2	500	1
	60	75	1	.....	..	1,250	1	1,250	1	4,040	4
	others	4,960	1	4,600	1	3,775	1	4,515	2	4,515	2
Kyushu	50	4,605	6	5,485	5	12,404	6	37,570	10	41,370	12
	60	8,465	19	8,930	8	10,250	10	9,190	8	9,542	9
	others	9,610	7	17,520	7	23,335	7	29,725	7	60,785	6
Tohoku	50	1,790	4	2,440	4	2,762	2	11,882	11	26,610	13
	60	8,812	11	8,602	8	11,514	8	22,118	13	18,921	17
	others	15	1	15	1	15	1	.....	..	.....	..
Hokkaido	50	2,750	7	4,107	4	7,180	6	20,230	8	11,640	7
	60	175	2	.....	..	12	1	375	2	2,024	3
	others	.....	..	.....	..	.....	..	.....	..	.....	..
Total	50	16,970	23	33,160	22	41,969	23	95,873	45	119,187	55
	60	31,182	58	33,185	30	46,326	37	89,632	62	102,027	81
	others	16,640	10	24,135	10	33,490	11	40,605	11	71,605	10

Letters from Our Readers

A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute

Using Three-Phase Meters on Ranges

To the Editors of the ELECTRICAL WORLD:

Referring to article by William Quandt in the issue of February 9 with reference to the use of three-phase meters on ranges, the writer's experience has been that 110-volt operation even from three-phase mains is not entirely satisfactory. Our company operates many 4,800-watt water heaters with the ordinary 5,400-watt range. The water heaters are arranged for 110/220-volt operation, but when installed with a range are always operated at 220 volts. For an installation of this type a No. 4 service loop, 25-amp., three-wire meter with a 60-amp., three-pole safety switch and meter trim make a very satisfactory combination. From the standpoint of inaccurate metering the operating company will not suffer as much from the unbalance of the potential circuit of the meter as would be lost by increased voltage drop with the 110-volt, three-phase service.

From the point of view of first cost the three-phase meter represents double the investment. From the meter department's standpoint the cost of operation, both installing and testing, is nearly double in the case of the three-phase meter. From the distribution standpoint at least two transformers are required to supply three-phase service.

It is our experience that three-phase, 110-volt service has long ceased to be useful and that any gain in revenue through the use of three-phase metering for range services is more than offset by the limitations of that voltage. The writer would be pleased to hear the views of others along this line.

MERTON F. TAYLOR.
Meter Department Central Maine Power Company.
Augusta, Me.

Superstandard Electrical Code Not Desirable

To the Editors of the ELECTRICAL WORLD:

I have read with interest the article on the underwriters' viewpoint of a superstandard electrical code, by F. J. T. Stewart, which appeared in the November 10 issue of the ELECTRICAL WORLD. I can quite agree with the writer of this article that two electrical standards would prove highly undesirable and, from our point of view, indefensible.

As a general proposition, fire prevention and safety legislation are based upon the demand for protection to property and life, and hence any such legal regulations must be a reasonable minimum which will secure safety to property and life.

When the Wisconsin State Electrical Code, which is based upon the two national electrical codes, was up for consideration the proposal was advanced that two standards be enacted—a standard for new installations and a considerably lower standard applying to existing installations.

On the face of it this appeared logical, but when it was recalled that it is the duty of the Industrial Commission of Wisconsin to ascertain, fix and prescribe reasonable standards of safety so as to render such installations safe, it became evident that legally there can be only one such standard of safety, and this a reasonable minimum. In other words, after we have once determined what the reasonable minimum is, we cannot arbitrarily say that because an installation is new a higher standard shall apply. The mere fact that the installation is a new one or an existing one does not make it any greater or lesser hazard to property or life.

For this reason a single electrical standard was adopted which applies alike to old and new installations. While the present Wisconsin State Electrical Code, which, as already stated, follows closely the two national codes, may be considered a high standard compared with no standard, it nevertheless constitutes a reasonable minimum for the protection of property and life.

In conclusion, therefore, it would seem that a superstandard electrical code not only is undesirable, but if developed could not be enacted into law, because the very name "superstandard" implies a considerably higher standard of construction than might rationally be deemed a reasonable minimum.

JOHN A. HOEVELER,
Industrial Commission of Wisconsin, Electrical Engineer.
Madison, Wis.

Condemnation of Idea that a Utility Business Should Build on Others' Misfortunes

To the Editors of the ELECTRICAL WORLD:

Editorials appearing in the ELECTRICAL WORLD are usually broad-minded and constructive, as they should be. Thus when one appears which does not measure up to this standard it may be immediately singled out for critical comment.

In the December 8 issue the editorial entitled "The Stability of Electric Light Securities" contains this sentence: "During the last decade not one strictly electric light and power company has defaulted in its securities, a record unapproached in the entire public utility field; whereas the investment market is strewn with the wrecks of water, gas, telephone, railroad and railway companies innumerable."

It seems unnecessary to me to make this unfavorable comment on the other utility companies in order to bring out the good points of the electric light and power companies. In addition to being improper from the standpoint of policy, is it not rather a mistatement to say that the investment market is *strewn* with the wrecks of these companies? Particular reference was made, no doubt, to the unfortunate situation confronting electric railways due to a combination of fixed rates, a large and rising labor charge and political attacks which have been in many cases unwarranted. The various branches of utility business have many aims and problems in common, and the present friendly spirit which exists between them cannot be strengthened by statements of the character to which reference has been made.

RALPH W. LIDDLE.
Chicago, Ill.

[The ELECTRICAL WORLD is primarily concerned only with the electrical industry, and public utilities form a large part of that industry. However, all public utilities are not alike, nor do they render the same class of service. It is unfortunate that some of the others have had "hard sledding" at times but the electric utilities will be severely handicapped, particularly in matters affecting finance, unless a plain differentiation is made between their financial standing and that of other utilities. The particular phrase used may have been somewhat exaggerative, but in self-protection comparisons must be made and they are not flattering to the other utilities. Should truth be suppressed because of that?—EDITORS.]

Central Station and Industrial Practice

Installation, Operation, Maintenance, Test and Repair of Generation and Distribution Equipment, and Methods of Economically Utilizing Electric Service in Large Industrial Plants

Unit Packages of Material for Making Splices

By C. H. Shaw
Engineer of Distribution and Installation Department, New York Edison Company

THE large number of different pieces of material required to make a splice of lead-covered cables is frequently found to be a cause for delay through oversight in providing a sufficient quantity and the proper size and style of each item. It also forces the foreman to spend much time writing his requisitions for each of the several articles and the stock clerk to prepare them for him as well as make the charge entries.

In order to eliminate the possibility of delay and confusion, and also to economize in the amount of material used as part of the splice, as well as in its production, a careful study was made of the specific quantity of every item that is needed for each type of splice. This study has resulted in the preparation of a quantity list of every item required, by means of which the storekeeper is able to assemble in a single container all of the connectors, solder, lead sleeve, insulation, tape, compound and miscellaneous material that is needed. The cartons are designed to be just large enough for all the materials and when filled are sealed and labeled with a large paster showing in detail every item that is provided. The packer signs and dates these lists, leaving a duplicate inside the package. In drawing material out of the storeroom the foreman needs to specify only the unit package he desires and has no need to concern himself about any additional supplies. Fuel for the furnace is the only consumable item that is not included in these packages.

These unit splicing packages are made up and carried in stock for different types of low-tension and high-tension feeder cables by the New York Edison Company. Two lists are shown herewith, one being for a standard splice of a two-conductor concentric direct-current feeder cable and the other for three-conductor 350,000-circ.mil 11,000-volt cable. This method of assembling material has been in use for several years and gives great satisfaction. In the emergency room of the distribution department a complete set of splicing tools is kept with a splicing unit for every type of splice, so that when trouble occurs or an emergency arises the box containing the tools and splicing material can be rushed to the job without waiting an instant to pick up and sort out the particular supplies that are needed.

THE NEW YORK EDISON COMPANY
DISTRIBUTION DEPARTMENT
LOW TENSION DIVISION
CONSTRUCTION UNIT

Cable 2 x 1 000,000 C. M.

Sleeve	4⅛" x 15"
Solder	4 Lb. Pig and ½ Lb. Bar
Connector	(1) 1,000,000 C. M.
Wooden Tube	(1)
Tinned Sheet Copper	(4" x 8¼") (1)
Waste Ends	(¼) Lb.
Emery Cloth	(½) Sheet No. 0
Asbestos Wicking	(½) 2 Feet
Plain Cotton Tape	12 Feet
Pasters	(6)
Paraffin	(3) Lbs.
Iron Wire	(8) Feet
Impregnated Wicking	(1) Roll 1⅜" x 12'
Impregnated Wicking	(1) Roll 1½" x 6'
No. 11 Cotton Sleeving	(3) Pieces 4½" long
Sleeves No. 12 B & S Tinned Copper	(3)

Packed by ..... Date .....

This unit contains the above material in good condition. If seal is broken or any defect found, same should be reported at once.

THE NEW YORK EDISON COMPANY
DISTRIBUTION DEPARTMENT
CONSTRUCTION UNIT

Cable 3 x 350,000 C. M.	6600 7800 11000	Volts
Paper Insulation	10 (3 oz. Roll)	
Sleeve	18" x 4½"	
Connectors	3-350,000 C. M.	
Solder	4 Lb. Pig and ¼ Lb. Bar	
Emery Cloth	½ Sheet No. 0	
Waste Ends	¼ Lb.	
Paraffin	4 Lbs.	
Cleaning Cloth	6" x 24" Cloth	
2295 Compound	1 Pint	
Pasters	6	

Packed by ..... Date .....

This unit contains the above material in good condition. If seal is broken or any defect found, same should be reported at once.

DELAYS IN EMERGENCY REPAIRS PREVENTED BY HAVING ALL MATERIAL IN ONE BOX

Horn Gap Used as Fuse on 11,500-Volt Line

By Edward N. Horr

FACING the problem of finding a reliable fuse for outdoor service on 11,500 volts under rather extreme conditions, a Mid-Western company experimented a great deal until it found that horn gaps with aluminum fuse wire gave exceedingly good results. The territory served was occupied largely by industries, practically every plant being served by duplicate overhead lines, making an extensive system of interconnected circuits. The usual practice was to persuade the consumer to build an indoor substation with oil-switch protection wherever the size and permanency of the installation warranted the expense, but in many cases an outdoor substation was necessary, especially on the smaller installations where outdoor oil switches were deemed too expensive.

Ordinarily such installations are simple in design and remarkably reliable, but in this case the atmospheric conditions were such that copper, iron, brass and porcelain were very quickly corroded, rusted or covered with heavy conducting coatings. Acid, fertilizer and cement plants, oil and metal refining processes and refractory processes acted in conjunction with a high average humidity to produce these conditions. In some locations 45,000-volt and 60,000-volt insulators required changing after a few months' service to prevent failures and flashovers on an 11,500-volt line.

Several types of inclosed fuses using insulating tubes and spring contacts worked well until they were called upon to break the circuit once or twice or had to be pulled for some other reason. The contacts broke and burned, and cemented porcelain mountings came apart through dis-

integration of the cement. Deposits on the insulating tubes caused arcs after the fuse had blown, and in some cases very serious trouble resulted. It was soon found that the number of fuse-mounting replacements was extremely high, and in addition considerable time was lost whenever a simple re-fusing job turned out to be a mounting replacement job.

It was then decided to try the old horn-gap fuse. The gaps were made from old mountings using clamp insulators and No. 3/0 horns. The horns were carried in heavy brass clamps and the aluminum fuse was connected under separate clamps held on with ½-in. bolts and given a turn around the horn at each side. The installation was made so as to relieve the mounting of all strain except that of the connecting jumpers, and the spacing between phases was increased slightly for additional safety.

Aluminum Fuses Resist Corrosive Atmosphere

The aluminum fuses soon became oxidized and seemed to resist the corrosive atmosphere very well, and as far as known no failure due to exposure of the wire to wind or snow has occurred. Taken as a whole, the installations made were highly satisfactory from an operating viewpoint, for, in addition to their low cost and comparatively long life, no large stock of special fuses is required and any troubleman with a switch stick and a coil of fuse wire can quickly replace the fuses. Formerly fuse sizes were regulated by transformer sizes, each foreman and troubleman being provided with a carefully prepared guide for both single-phase and polyphase installations and a small kit of various sizes of tested wire.

Although very few operating companies will experience such generally bad atmosphere as was encountered in this district, some may profit by the foregoing experience for unusual cases.

Objections will arise that the horn gap does not break the circuit as quickly as a different type of fuse. This is true, but it is also true that a horizontally mounted horn gap will do better than a vertically mounted expulsion or chemical fuse which has broken and permitted an arc to form. Surge protection must be good to use horn gaps to advantage, but this entails no extra expense if the operating company has already provided the lightning protection which it should.

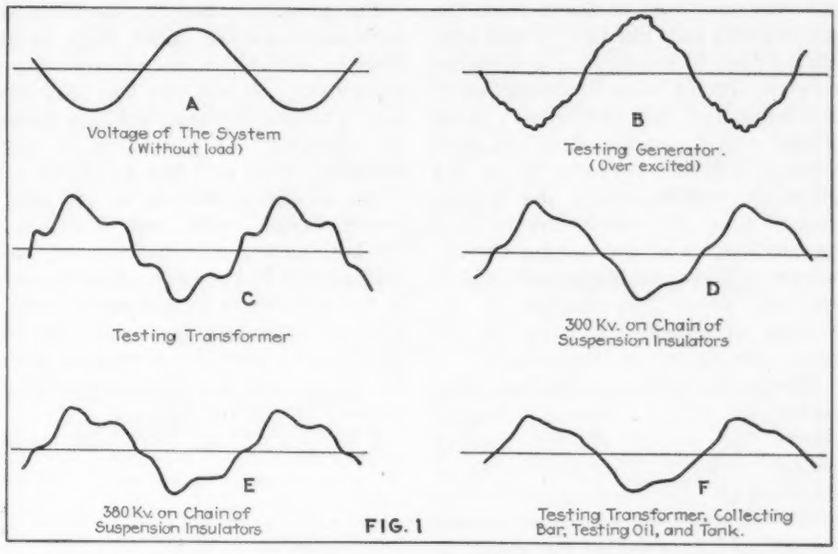


FIG. 1

WAVE SHAPE OF TESTING VOLTAGE UNDER VARYING CONDITIONS AS RECORDED BY ACTUAL TESTS WITH AN OSCILLOGRAPH

Importance of Sine Wave for Test Voltage

By M. F. Dahl
Chief Engineer Brown, Boveri & Company, Mannheim, Germany

ALL engineers have recognized how important it is to have sine waves when making voltage tests, but it is doubtful how many have any conception of the effect which departure from the sine waves will have on the results obtained. Furthermore, the susceptibility of a sine wave to distortion by many test circuits may not be as fully appreciated as it should be.

According to tests made by the author, the form of the voltage waves has a very decided influence on the classification of the electrical properties of porcelain insulators, especially those of the suspension type. Furthermore, a small change in the test circuit or in the arrangement of the object under test will also affect the wave form to a considerable extent. In one case while testing a high-tension insulator the voltmeter recorded 130 kv., whereas

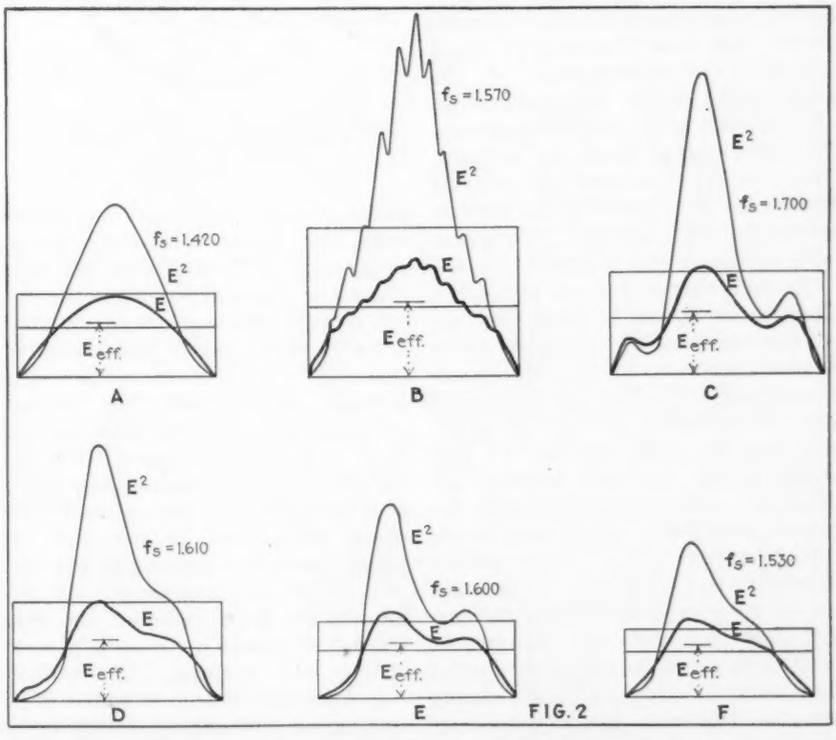


FIG. 2

HALF WAVES DRAWN ACCORDING TO METHOD OF INTERPOLATION

the real peak voltage taken from the oscillogram was 152 kv. It was concluded that in conducting acceptance or comparative tests of insulators it is necessary to remember these things and to realize that the peak voltage will not necessarily be the effective voltage times the square root of two. It is necessary to have an oscillogram of the testing voltage waves. These oscillograms emphasize the effect that changes in the testing arrangements have on the amplitude factor of the wave.

The foregoing statements are illustrated by Figs. 1 and 2. Fig. 1 shows the waves of the testing voltage under varying conditions as recorded by the oscillograph. The half waves drawn according to the method of interpolation are shown in Fig. 2.

Preventing Ice Formation on Water Turbines

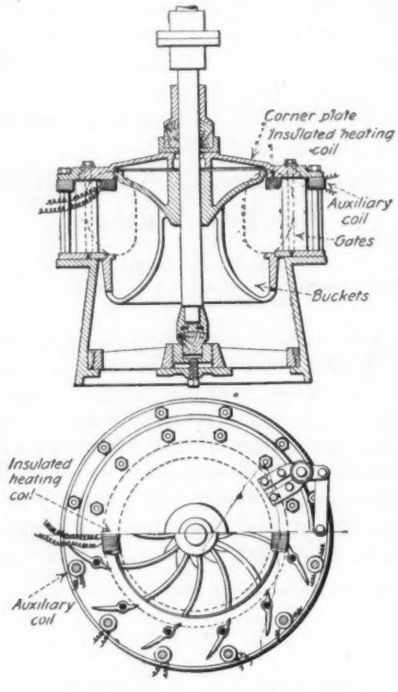
BY R. S. HYATT
Engineer Cornell Hydro-Electric Company, Valentine, Neb.

ONE of the principal difficulties encountered in the operation of hydro-electric plants in the colder climates has been due to clogging of turbines and waterwheels with frazil ice, rendering them inoperative and often causing a shutdown of the entire plant. The writer's experience of several winters with very severe ice conditions, substantiated by a number of other investigators, has been that a very small difference in temperature of the metal parts above the temperature of the water will absolutely prevent the adherence of frazil ice to them. The problem has been to get this heat to the metal parts of the turbine efficiently and without interfering with the use of the machine.

By referring to the accompanying illustration it will be seen that the arrangement of the turbine parts forms a closed magnetic circuit, with the runner as the central portion and the flux returning through the gates and spacing bolts, similar to that found in the core-type transformer. Placing a stationary coil above the runner produces a transformer action with the iron parts of the turbine forming the secondary. This gives an effective means of heating the turbine and preventing the adherence of ice. The principle has been applied to a plant operated by this company on the Niabrara River with very satisfactory results.

The plant consists of two vertical turbines operating under 12-ft. head directly connected to umbrella-type generators. A test coil has been attached to one of these turbines without alteration of the parts in any manner. This coil has an input of 3 kw. at approximately 60 per cent power factor with coil losses of 0.3 kw., giving an efficiency of approximately 90 per cent. The runner of the turbine is considerably worn, with an attendant large air gap in the magnetic circuit. A turbine with the proper air gap would materially increase the power factor.

A number of runs have been made



ARRANGEMENT OF TURBINE PARTS SHOWING LOCATION OF HEATING ELEMENTS

under actual frazil-ice conditions, with the result that the turbine equipped and heated with the coils showed no signs of ice, while the one not so equipped was completely shut down several times and required thawing to place it in service. As a more severe test the turbine equipped with the coil was allowed to become partly clogged with ice, the gates having become inoperative at 0.8 opening and the output of the wheel diminished 75 per cent, at which time the switch supplying current to the coil was closed. In five minutes the gates loosened, and soon the wheel picked up load in proportion to gate opening. The turbine was examined fifteen minutes after closing the switch and found to be entirely free from ice.

It may seem that so small an amount of heat would be lost in the cold water before it had opportunity to bring about the required effect. It has, however, been definitely stated by several authorities that 0.001 deg. will prevent the adherence of frazil ice.

Concrete Reinforced with Copper Trolley Wire

BY G. H. MCKELWAY
Westfield, N. J.

IN CONSTRUCTING floors to support reactors used in generator or feeder circuits care must be taken that induced currents do not heat any steel built into or supporting the floor so that either it is weakened or its bond with the concrete surroundings is destroyed through expansion. The usual way of avoiding this trouble is to use plain and not reinforced concrete in the floor and to keep the floor beams away from the reactors as much as possible.

In one large power station it was found that the limited space allotted to the reactors would require that they be placed on unusually short centers. This, in turn, would place so much weight per square foot upon the floor as to make metallic reinforcement necessary.

As it was believed that steel rods could not be used for reinforcement —in fact, one at a distance of several feet from a reactance became so warm that its temperature could not be measured by a thermometer reading to 230 deg. F.—it was at first decided to use bronze rods in place of them. But, on account of the high cost of the bronze rods and also because a sufficient supply of them could not be obtained without considerable delay, while it was important that the floor be built as soon as possible, thought was given to what other material could be used, and the suggestion was made that lengths of trolley wire be cut and formed to take the place of the rods.

The power station supplied current to electric railways, and investigation showed that there was sufficient trolley wire in stock and on order to permit the use of some of it for reinforcing material. It was at first thought that used wire might be suitable if the reinforcement were placed on close centers so as to make up for the weakened condition of the wire owing to part of it having been worn away in service. However,

closer inspection showed that the wear was so uneven that it would be unsafe to take any definite area as the average of the wire and calculate the strength of the wire from what would be expected from a wire of that cross-section. It was therefore decided that the only safe way would be to use new wire.

It might have been inadvisable to use the ordinary hard-drawn copper trolley wire for this service, if second-hand, even if it had been worn evenly, because this wire becomes so annealed after long service that its strength when taken down is much less than when it is first run. The wire that was used, however, was of a special alloy and had approximately the same strength as the bronze bars which it was first thought would have to be used for this construction.

This wire was so stiff and springy in the size employed (No. 3/0) that it was very difficult to bend. Special forms were made to handle it. These were made by laying out the proper shapes on heavy boards and fixing the points of bending by means of bolts projecting up through the boards. So much force was required to bend the wire around these pins that it was found necessary to have each bolt project through a heavy square metal washer set into the board, as otherwise the pin would be pulled out of line when the strain came upon it, the wood alone not being strong enough to hold it up vertically.

The wire has now been installed and is giving entire satisfaction, although care had to be taken that the different portions were not permitted to come in contact with each other and form loops which might have acted as the secondary of a transformer to the coils in the reactors.

Overhead Distribution Construction

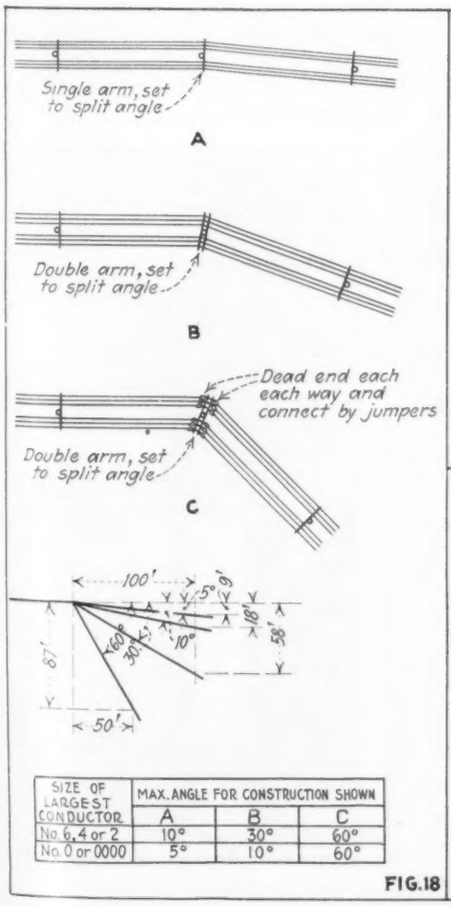
Standardized Practice as Developed and Used by the
WEST PENN POWER COMPANY, PITTSBURGH

Construction for Angles and Street Corners

Angles.—Cross-arms shall be used at angles of less than 60 deg. as shown in Fig. 18. Poles at such angles shall be set so that the cross-arms split the angle. Where conductors are deadened each way at angles they shall be connected by jumpers of the same size as the line, tied to insulators on the pins of the double arms. For angles greater than 60 deg. the construction shown in Fig. 19 shall be used withinu city or borough limits unless prevented by special conditions. Where necessary, or outside city or borough limits where space is available, a two-pole angle construction (Fig. 20) shall be used.

Pole Steps.—All poles carrying branch cut-outs, transformers, street lamps, meters or other attachments that may require frequent attention shall be stepped. The steps shall be fitted to the pole by boring ⅝-in. holes 3½ in. into the pole in the locations hereinafter specified and driving the steps into these holes until they project 5½ in. from the pole. The steps shall be ⅝-in. x 9-in. standard galvanized pole steps.

Steps shall be placed on both sides of the pole 6 ft. 6 in. from the ground and then alternately on each side to a distance of not less than 4 ft. 6 in. from the top of the pole. The spacing shall be 36 in. between steps on the same side of the pole. A single standard wooden-pole step shall be placed on the pole below the metal steps at not less than 3 ft. 6 in. from the ground. The pole steps shall always be placed in line with the lead.



SIZE OF LARGEST CONDUCTOR	MAX. ANGLE FOR CONSTRUCTION SHOWN		
	A	B	C
No. 6, 4 or 2	10°	30°	60°
No. 0 or 0000	5°	10°	60°

FIG. 18

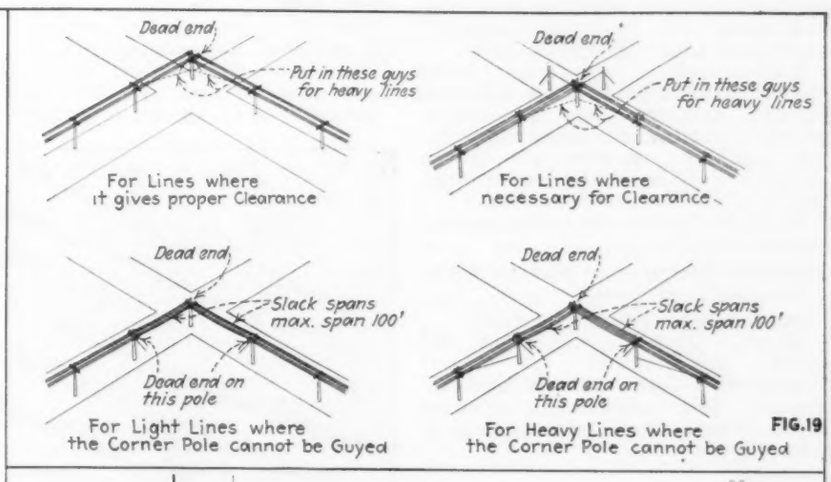

Dead end
Put in these guys for heavy lines
For Lines where it gives proper Clearance
Dead end
Put in these guys for heavy lines
For Lines where necessary for Clearance
Dead end
Slack spans max. span 100'
Dead end on this pole
For Light Lines where the Corner Pole cannot be Guyed
Dead end
Slack spans max. span 100'
Dead end on this pole
For Heavy Lines where the Corner Pole cannot be Guyed

FIG. 19

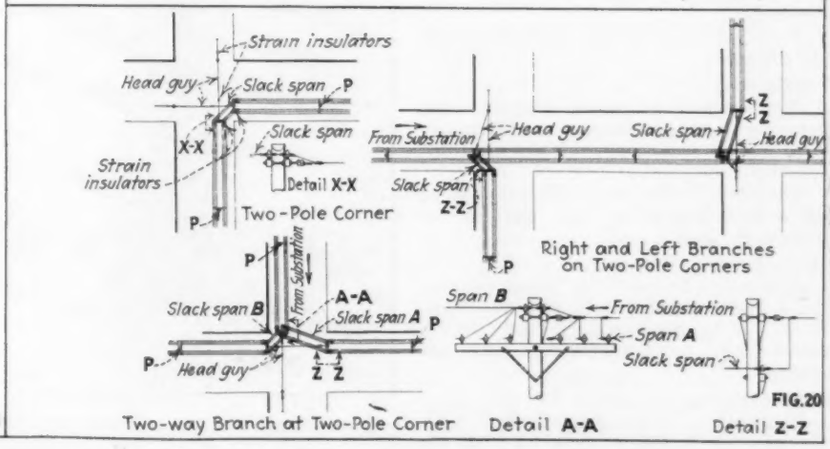


FIG. 20

FIGS. 18 TO 20—ARRANGEMENT OF POLES, CROSS-ARMS AND GUYS ON ANGLES AND CORNERS

Fig. 18—For angles greater than 60 deg. use corner construction as shown in Fig. 19 or Fig. 20. Fig. 19—Construction for single-pole corners. Fig. 20—This construction should be used only when single poles, as shown in Fig. 19, cannot be used.

Inspection of High-Tension Apparatus

Schedule Followed by Texas Company in Covering Arresters, Insulators, Wiring, Transformers, Fuses, Choke Coils, Circuit Breakers and Air-Break Switches

UNLESS specific instructions based on operating experience are given to inspectors to guide them in looking for faults that may lead to trouble, they are likely to overlook apparently minor details which may have a very important bearing on the continued and reliable operation of the equipment. To obviate this possibility the Texas Power & Light Company, Dallas, Tex., in issuing directions regarding the inspection and maintenance of high-tension apparatus, covers thirty-nine specific items which are listed below:

HIGH-TENSION APPARATUS

Structure:

Annually—Tighten all bolts.

Transformer-Fuse-Air Switches:

Annually—Inspect for danger sign in case body can come in contact with conductors in climbing pole. See that pole is stepped.

Lightning Arresters (General):

Annually—Inspect "Z" bars and pipe framework supports of aluminum and oxide-film arresters and paint with graphite if necessary. Inspect bushing caps on aluminum arresters and paint with signal red. Paint iron tanks not galvanized with transformer paint.

Semi-annually—Check gaps, horns and charging strips for loose bolts and position, ammeter jacks for broken porcelain and transfer device for working condition. Replace all broken charging resistances and broken insulators on aluminum-cell arresters.

Monthly—Inspect for loose ground connection.

Lightning Arresters (Aluminum Cell):

Biannually—Overhaul.

Lightning Arresters (Oxide Film):

Monthly—Test for blown fuse and tighten all connections.

Quarterly—Test cells with glow indicator. Test indicator by shunting across three cells; if indicator is good, tube will glow.

Grounds:

Biannually—Measure resistance of all grounds.

Insulators:

Biannually (strain)—Inspect for grounds on eye bolts and oscillate.

Annually (pin type)—Make close inspection for cracks.

Quarterly (indoor station)—Wipe off any incrustation that can be removed by oxalic acid.

High-Tension Wiring:

Annually—Inspect for loose connections and crystallization due to vibration. Note particularly the tubing connections to transformer and arrester.

Transformers:

Biennially—Power transformers; filter oil. If possible, oil should be removed from tank; the walls of the tank and the coils should be then cleaned by flushing with oil.

Annually—Inspect transfer track for rotten timber. Paint power transformers if necessary.

Semi-annually—Take all oil samples for instruments under 300 kva. For high-tension type inspect for loose connections, condition of fuses and condition of supports; clean, stop leaks and note oil level. Paint with graphite paint. Change oil.

Quarterly—Test water-cooling coils for leaks with 75 lb. air pressure. Inspect bushings, compound and oil filled. Take oil samples for instruments of 300 kva. or over.

Two months—Inspect breathers.

Monthly—Clean tanks, oil gages, thermometers and valves. Stop oil leaks. Do not try to stop a leak by calking, as this very often increases the leak. Inspect bushings for leaking compound and cracks. Report leaks by joint number, cracks by disk number. Clean bushings if transformer can be taken out of service. Oil should be at gage center with transformer temperature at 30 deg. C. Oil used to replenish should be No. 10.

Fuses:

Quarterly—Inspect high-tension units for broken glass and loose connections.

Choke Coils:

Quarterly—Remove bird nests.

Oil Switches (High-Tension):

Biennially—Change or filter oil. Clean inside of tank and mechanism.

Annually—In internal inspection look particularly for loose bolts, loose nuts, loose and broken contacts and dirty oil; examine conditions of alarm mechanism. Paint if necessary. Inspect and check setting of relays.

Quarterly—Inspect, noting particularly bearings, mechanism, bushings, oil level and general cleanliness.

Two Weeks—Bell alarms on 22, 33, 60 kva.; test by closing by-pass and tripping.

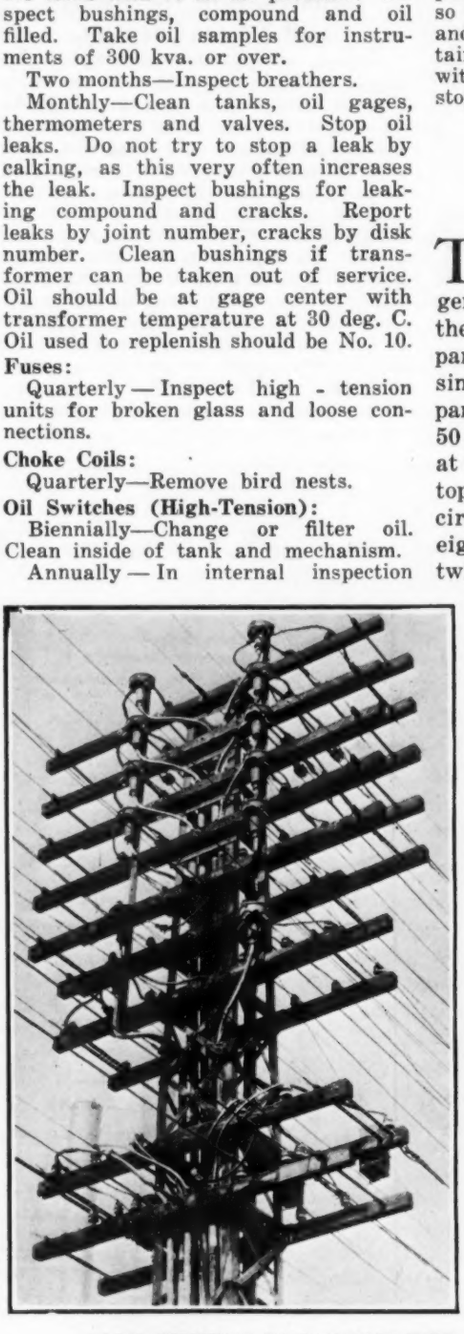
Bell alarms on 11 kv.; test by opening control switch between 1 a.m. and 3 a.m.

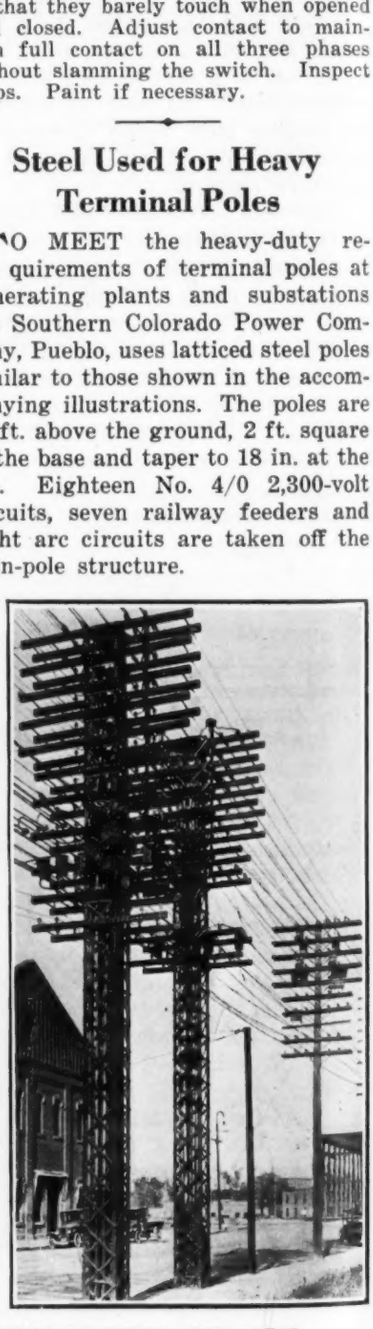
Air-Brake Switches (High-Tension):

Annually—Inspect, adjust, tighten bolts and nuts and see that movable parts operate freely. Set arcing horns so that they barely touch when opened and closed. Adjust contact to maintain full contact on all three phases without slamming the switch. Inspect stops. Paint if necessary.

Steel Used for Heavy Terminal Poles

TO MEET the heavy-duty requirements of terminal poles at generating plants and substations the Southern Colorado Power Company, Pueblo, uses latticed steel poles similar to those shown in the accompanying illustrations. The poles are 50 ft. above the ground, 2 ft. square at the base and taper to 18 in. at the top. Eighteen No. 4/0 2,300-volt circuits, seven railway feeders and eight arc circuits are taken off the twin-pole structure.





STEEL TERMINAL POLES WHICH WILL STAND UP UNDER SNOW, SLEET AND HEAVY WINDS

Left—Manner of bringing lead cables out through latticed steel pole. Right—Thirty-three circuits, most of them No. 4/0, are taken off these terminal poles. All conduits are placed on the inside of steep poles, making a neat appearance.

Central Station Business

Advertising, Selling and Service Methods
Commercial Organization and Management, Customer and Trade Relations, Public and Financial Policies, and Reports of Company Plans and Experiences

Determining the Advertising Value of an Electric Sign

Investigation Shows that Electric Illumination Increases Public Familiarity with Sign Eight Times—68 per Cent of Buildings Without Electric Signs Are Unknown

TO MEASURE as far as possible the advertising strength of an electric sign a test of the general public's attitude toward this type of advertising was recently made in Cleveland. The value of an electric sign is measurable largely in terms of the relative familiarity of representative people with buildings or places of business which are in all respects equivalent except that one-half have electric signs and the other half do not. This was made the basis of the investigation.

After a careful analysis of virtually all of the business houses, buildings and other institutions using electric signs, twenty-five pairs were selected. The things advertised included mortgages, automobiles, storage houses, banks, clothing stores, furniture stores, office buildings, churches, etc. The chief difference between each two that were paired was that one had an electric sign and the other did not.

To a number of people not interested in electrical advertising was given a list of names of these buildings and stores arranged promiscuously but so that no corresponding pair came together. Each of these individuals asked several friends, also selected at random from all walks of life, the two following questions:

1. Do you know where ——— is?

2. How do you remember the location?

So far as possible they avoided discussion and gave no explanations. No mention was made of signs or advertising or even of electric light. They recorded the answers as follows:

To question No. 1, yes or no.

To question No. 2 there were many answers, but it was soon found that these could be classified as follows:

A. Because of the sign (often not specifying electric or otherwise).

B. Because of general familiarity, or because of passing by the location so often.

C. Because of business or friends connected with the organization.

D. Because of other advertising.

E. For miscellaneous reasons or for no apparent reason.

The questions were put to forty-three different persons, being nearly equally divided between men and women. Their answers are classified here.

While an exact check was not, of course, expected, it was gratifying to note the predominance of those who located buildings by the electric sign. In those cases where ability to locate was attributed to "general familiarity" or "frequent passing" (the "B" answers) oftentimes the sign must, subconsciously at least, have undoubtedly been a factor.

In those cases (the "A" answers) where a sign was specifically mentioned, and in many of which it was called an electric sign, is to be found a direct measure, though by no means the only or the complete measure, of the relative values of illuminated and unilluminated signs. The figures on this basis alone would indicate that illumination increases the value of a marker eight times.

A basis for a real answer to the question "How much is an electric sign worth?" is found in the answers to question No. 1, "Do you know where such and such a building is?" Sixty-eight per cent of the buildings without electric signs were totally unknown, while 63 per cent of their electrically advertised competitors had left a permanent picture association in the minds of individuals passing.

PERCENTAGE OF PERSONS ABLE TO LOCATE BUILDINGS HAVING ELECTRIC SIGNS

	Question No. 1	Question No. 2				
		Reason Assigned for Remembering Location				
	Location of Building	A	B	C	D	E
	Percentage of Total Correctly Located	Sign	General Familiarity or Frequent Passing	Business or Personal Acquaintance	Other Advertising	Miscellaneous Reasons
Buildings, etc., having electric signs	63	40	11	13	4	2
Buildings not having electric signs	32	5	9	13	4	2

Dayton Company Gains the Esteem of City Officials

BY CONSISTENTLY rendering a high standard of electric service that has gained the good will of the public and by going a little bit out of the beaten path of public utility activities in offering city officials the use of the company's auditorium for dinner conferences, the Dayton (Ohio) Power & Light Company has developed most friendly relations with these city officials and incidentally secured a traffic privilege which was unsought but nevertheless very welcome.

For some time it has been the custom of the officials of the city of Dayton to hold regular monthly dinner conferences which are attended by the mayor, the city manager, the city commissioners, the directors of the safety, service, financial and welfare divisions and many city employees holding positions varying in responsibility. Feeling free to ask the privilege because of the company's public service policy, F. O. Eichelberger, city manager, not long ago not only requested permission to hold one of its meet-

ings in the company's auditorium dining room but also asked that some member of the public service company's organization would speak on "Our Mutual Relations with the Public," adding, "Your patrons are our employees, and many of your problems in dealing with the public are our problems."

The Dayton Power & Light Company welcomed the opportunity, and the meeting was attended by about 125 people, including four company officials. F. M. Tait, president of the company, discussed the subject assigned to him and received hearty applause from the city officials. The opinion seem to prevail that the Dayton company had "made good" in every way in establishing satisfactory relations with the public which it serves, and it was commended for taking an active part in movements to benefit the city.

One of the definite results of the meeting was a resolution adopted by the City Commission at its next regular meeting authorizing the company to equip its emergency automobiles with siren whistles of the type that are used by the city fire and police departments and granting such equipment the right-of-way privileges which previously were extended only to the police and fire departments.

Night Classes in Electric Domestic Science

A PRACTICAL course of instruction in the use of electrical labor-saving devices for girls and women has been started in the night classes of Hutchinson High School, Buffalo, by Miss Laura Rischman, domestic science expert of the Buffalo General Electric Company. The success of a few similar classes held last winter led the state supervisor of vocational instruction in night schools to request that the course this year be a complete unit. The course includes the following:

First week—Use of the electric range.

Second week—Sunday night supper prepared entirely by electricity, including the use of the chafing dish, grill, ovenette and percolator.

Third week—Instruction in the use of the electric washer and electric ironing machine, including handling of fine linens and lace.

Fourth week—The waffle iron and pancake griddle.

Fifth week—The proper care and improvised repairing of electrical appliances, including the refitting of cords. This lesson includes a practical demonstration and explanation of the parts which make up an electric flatiron.

Sixth week—Use of electrical devices in home nursing, including the vibrator, heating pad, violet ray, immersion heater and baby-food warmer.

A phase of this work that will be of interest to central-station companies generally is the fact that in conducting classes of this nature it is sometimes convenient to hold some of the lessons in the appliance department of the company.

Appliance Sales Amount to $16.36 per Customer

THE average merchandise sales for the entire property of the Idaho Power Company for 1923 was $16.36 per residence customer. Effort was concentrated on building up load on existing lines, with the result that the connected load of appliances sold amounted to more than 6,700 kw., with an estimated annual revenue of over $82,000. This is an average of $12.20 per kilowatt of appliances connected.

The gross merchandising sales might have been increased had not the company been interested primarily in putting out labor-saving and load-building devices with a view to increasing consumption rather than making large merchandise sales. In addition to definite merchandise sales campaigns for 1924, the company will further concentrate its efforts on selling increased lighting wattage as well as load-building devices. Several new lines of appliances and apparatus will be added, and it is expected that 1924 will be a big year.

An Exclusively Industrial Electric Heating Store Is Opened in Providence

THERE have been a number of industrial electric heating exhibitions, and many central-station companies maintain a department in charge of an engineer specially trained for developing this class of business. The above illustration shows the industrial electric heating store of C. I. Hayes in Providence, R. I., which, so far as is known, is the only one of its kind in the United States. While the store has no connection with the local central-station company the arrangement offers an excellent opportunity for co-operative load-building effort.

Methods of Improving Contact with Public

SERVICE to a customer is more than the mere delivery of power, declared W. S. Vivian of the Middle West Utilities Company recently. It consists of doing more than one is paid to do. It is the spirit back of this action that counts. The attitude and action of every one in a company, from the president down to the office boy, leaves its impression on the public. To instill the proper attitude into company employees public relations work must start with the highest executive. If he does not himself employ the methods which he desires to have reflected by his subordinates, he cannot expect them to apply the methods in dealing with the public. Actual ex-

perience has demonstrated that the following definite things have an important influence toward improving a company's relations with the public:

1. Establish pleasant office environment since this gives the customers their first impression.

2. Have regular conferences of employees at which policies and problems shall be discussed. The chairman should be a man down the line, not an executive of the company, although the latter should attend to lend moral support.

3. Send as many persons as possible to conventions to give them a broader viewpoint.

4. Induce employees to qualify for bigger positions.

5. Encourage the establishment of women's public information committees.

6. Support public utility information bureaus.

7. Give lectures on utility subjects before schools.

8. Develop public speakers to talk on utility subjects.

9. Invite newspaper men to attend conventions and conferences.

10. Advertise.

11. Induce employees to consider the purpose which the utility is trying to accomplish, instead of merely their individual jobs; but let them understand that by furthering the company's interests they are also benefiting themselves.

Low Ratio of Service Complaints in California

EVIDENCE of the low ratio of complaints to the total number of public utility consumers is shown in the statistics compiled by the informal complaint bureau of the Railroad Commission of California. From the accompanying tabulation it will be seen that of a total of 775,150 customers, only 686 registered a complaint against electric service companies. These complaints were of all kinds, including service conditions, rates, extensions and excessive bills.

Selling Irons by Mail

ELECTRIC iron sales by the Brooklyn Edison Company were considerably increased last year through a plan of mailing out by insured parcel post an electric flatiron to newly connected customers. Names and addresses were taken from the daily connection sheets. The iron, as received from the manufacturer in a carton, was wrapped securely with paper and twine, a card being inserted under the wrapper reading as follows: "It gives us pleasure to send you this electric iron for a trial. Connect the iron to any convenient electric outlet and it will be ready for use in a few minutes. Use the iron as though it were your own without the slighest obligation. In a few days our representative will call to give any detail information desired. Should you decide to keep the iron after giving it a thorough trial, please pay our representative 75 cents when he calls and the balance of the price of the iron will be added to your next four lighting bills, one dollar and fifty cents on each bill."

A mailing poster was prepared for each customer as follows: First, name and address of customer; second, wording "from Brooklyn Edison Company, 360 Pearl Street, Brooklyn, N. Y."; third, word "insured" stamped thereon; fourth, words "Return receipt requested" stamped thereon; fifth, package number corresponding to number on parcel post receipt noted thereon. Precanceled stamps were obtained from the post office covering 9 cents for mailing and 3 cents for $5 insurance. This provided an accurate check on the number of irons sent out and also enabled representatives to follow up and close sales with the least possible amount of lost motion.

COMPLAINTS AGAINST CALIFORNIA ELECTRIC SERVICE COMPANIES
Year Ended June 30, 1923

Name of Company	Complaints Received	Total Consumers	Complaints per 1,000 Consumers
Pacific Gas & Electric Co.	230	311,615	0.74
Southern California Edison Co.	112	188,654	0.59
Los Angeles Gas & Electric Co.	25	68,572	0.37
San Joaquin Light & Power Co.	72	51,056	1.44
San Diego Cons. Gas & Electric Co.	26	36,145	0.72
Great Western Power Co.	49	38,909	1.26
California Telephone & Light Co.	55	5,984	9.20
Western States Gas & Electric Co.	25	32,055	0.78
California Oregon Power Co.	14	10,483	1.33
Coast Counties Gas & Electric Co.	24	11,480	2.09
Coast Valleys Gas & Electric Co.	21	6,131	3.44
Vallejo Electric Light & Power Co.	14	5,122	2.74
Southern Sierras Power Co.	19	8,944	2.11
Totals and averages	686	775,150	1.13

What Other Companies Are Doing

New York City.—A series of specialized electrical shows, covering electric heating, electric signs, radio, therapeutics, trucks, household equipment, and power equipment, has been arranged for the coming months by the New York Edison Company. The exhibits will be held in the Irving Place showroom of the company, each will last one week, and admission will be free. The first of the series will be the electric heat show during the week of February 23; it will be followed by the electric sign show during the week of March 8 and the radio show will be held from March 22 to 29. Then will come the electrotherapeutic show, April 5 to 12; the electric truck show, April 19 to 26; the household equipment show, May 3 to 10, and the power show, May 17 to 24.

Omaha, Neb.—After experimenting with the electrical appliance business in one district and finding that it pays a sufficient return to justify its maintenance, the Continental Gas & Electric Corporation of Omaha has abandoned its nonmerchandising policy and established commercial departments in two of its subsidiaries, the Nebraska Gas & Electric Company and the Iowa Service Company. J. E. Flynn, who handled the experimental work for the company in the district centering at Red Oak, Iowa, is head of the departments in the two companies. He will be assisted by salesmen in each district and by a special force of "swing men" who will be used for campaign work.

Cincinnati, Ohio.—More than 65 per cent of the employees of the Columbia Gas & Electric Company and its various operating subsidiaries, the Union Gas & Electric Company, the United Fuel Gas Company and others, are now stockholders in the parent company. The percentage of shareholders is even more impressive if only the permanent employees are taken into account, as nearly all the 35 per cent of non-shareholders are listed as unskilled, casual labor. More than 90 per cent of the permanent employees, and practically all of those who come in contact with customers and the general public, are themselves active stockholders in the company they represent. In all, 36,500 shares of Columbia stock have been purchased by employees.

Digest of Electrical Literature

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Hydro-Electric Development and Steam Equipment

Developments in the Use of Pulverized Coal.—CHARLES LONGENECKER.—The author treats particularly the question of obtaining a sufficient furnace volume to insure proper combustion. He also discusses the question of why a powdered-coal furnace requires a long flame travel and large combustion space. Among other requirements are to obtain the requisite close associations of hydrogen with oxygen to insure complete combustion, the time element to carry out the process, to afford an opportunity to dispose of a portion of the ash and to prevent corrosion of the brickwork by the cutting action of the flame. He gives a detailed test conducted on a 520-hp. boiler.—*Power Plant Engineering*, Jan. 15, 1924.

Alcona Dam on Au Sable River.—W. W. TEFFT.—A two-unit 8,000-kw. plant operating under head of 41 ft. at minimum cost typifies the design of the plant to be placed in operation in the near future by the Consumers' Power Company on the Au Sable River. Features of particular interest are the cubical design of the plant with a conduit spillway beneath the power house, thin reinforced-concrete core wall, construction methods required by the presence of quicksand, the casting of steel-reinforced papier-maché conduit forms, etc.—*Power*, Feb. 5, 1924.

Hydro-Electric Plant of the Pacific Mills, Ltd.—G. S. BARRY.—A short article describing the new unit installed in the company's mill at Ocean Falls, B. C., increasing its output to 15,000 hp. The unit consists of a 6,300-hp. Pelton wheel directly connected to a 5,250-kva., 2,300-volt, three-phase, 60-cycle generator.—*Canadian Engineer*, Jan. 22, 1924.

Brimsdown Power Station in England.—The changes that have been made in this power station of the North Metropolitan Electric Power Supply Company in England since its construction in 1904 are given. At present there are four 5,000-kw. and one 3,000-kw. turbo-generators. The effect of modern developments on the equipment as originally installed has made it necessary to replace most of it. The distribution of the energy from the stations to consumers and to substations is also covered.—*Electrical Review (England)*, Jan. 4 and 11, 1924.

Progress in Steam Research.—The second annual report of the A. S. M. E. committee on progress in steam table research, with particular reference to the results of studies being made on the properties of steam at high pressures and temperatures, is given. Research work is being done at the Bureau of Standards, the Massachusetts Institute of Technology and Harvard University. The Bureau of Standards has developed a calorimeter for the purpose of surveying the behavior of steam. At the Massachusetts Institute of Technology progress has been made on the method by which the pressure, volume and temperature relations of saturated and superheated steam may be measured. At Harvard study has been made of the Joule-Thomson effect in superheated steam, particularly in the relatively low-pressure regions; that is, actual measurements have been made from 60 lb. per square inch to nearly 600 lb. per square inch.—*Mechanical Engineering*, February, 1924.

Generation, Control, Switching and Protection

Excessive Wear of Slip-Ring Brushes.—J. KOZISEK.—To eliminate this trouble the author suggests the following remedies, of which only one need be used: Install brushes 90 deg. or more apart, stagger on wider rings so that none trails a preceding brush, put blowers on the rings to blow the dust out sideways, install a shield behind each brush to collect the dust or cut slanting slots in the contact surface.—*Elektrotechnik und Maschinenbau*, Nov. 11, 1923.

Generating Power by Diesel Engines.—M. S. HOWARD.—Diesel engines are being used more and more for the generation of power, and this article gives the method for the general operation and overhauling of the engines.—*Power Plant Engineering*, Jan. 15, 1924.

Differentially Connected Relays for Protecting Electrical Machinery.—C. M. KING.—The author explains how differentially connected relays operate when trouble occurs in the equipment they are protecting and the conditions that cause relay action and the oil switch to open.—*Power*, Feb. 5, 1924.

Transmission, Substations and Distribution

Comparative Data on Towers for High-Tension Transmission.—WALTER DREYER.—A short article dealing with single-circuit and double-circuit towers for 220-kv. and 110-kv. lines, with special reference to design problems encountered at the anchor towers, etc. Data on the standard towers of the Pacific Gas & Electric Company are given in table form.—*Engineering News-Record*, Jan. 31, 1924.

Uniform Coefficient of Safety for High-Voltage Lines.—C. GASTEL.—The author gives and compares experiences and established standards of mechanical loads upon overhead high-voltage lines used in different countries. Based upon certain wind pressure, snow deposit or sleet load upon the wires, different nations have adopted certain safety factors which they deem adequate for their lines. The paper suggests that an international mechanical safety factor be standardized for all overhead lines. In the paper are considered and tabulated the rulings of the United States, France, Belgium, England, Austria, Germany, Norway, Denmark and Switzerland. Fewer restrictions in the right-of-way of a power line, general simplifications of the supporting structures and less conservative safety factors should be introduced everywhere, which would tend to make uniform the safety factors, at present widely at variance.—*Revue Générale de l'Electricité*, Jan. 19, 1924.

Units, Measurements and Instruments

Relation Between Corona Voltage in Air and the Distribution of the Electric Field on Electrodes of Varying Forms.—L. DREYFUSS.—It has been customary to call field concentration the maximum electric field on the surface of the electrode. According to the author, this cannot hold true, because there is only a little difference between the corona voltage on a sharp edge of an electrode and that on a slightly rounded edge; yet in the first case the field concentration is called infinity, while it is said to be finite in the latter case. It is much more plausible to assume that in all cases before corona can set in the normal puncture strength of the dielectric has to be exceeded within a finite distance from the most highly stressed point on the electrode. The finite distance may be called the ionization zone. A measure for the field concentration is the voltage drop δv within the ionization zone. If this δv exceeds a certain critical value, corona will appear. Methods are known and given in the article for calculating the field distribution on a variety of electrode shapes, such as, for example, plates, cylinders, concentric cylinders, etc. The author adds methods for computing the field on certain irregular electrodes with rounded and sharp surfaces.—*Bulletin de l'Association Suisse des Electriciens*, December, 1923.

Transformers for High-Voltage Tests.—A short article describing the work done by one British manufacturer now building high-voltage testing transformers.—*Electrical Review (England)*, Jan. 11, 1924.

Energy Consumption of Interurban Cars.—Tests made to allocate between cars of the Detroit United Railway and cars of the Detroit municipal system the energy used when operating on tracks of the latter indicated an average consumption of 120.4 watt-hours per ton-mile. In this computation the heater energy was also measured. To determine whether there was any close agreement in the testing of unit consumption on the longer country runs than in the city runs, a tabulation and plot were made of passenger-car tests of representative lines.—*Electric Railway Journal*, Feb. 2, 1924.

Alternating-Current Instruments With Electromagnetic Directing Force.—H. KAFKA.—The directing force of these new instruments is obtained from the induction between a stationary field winding upon a moving coil which is short-circuited over external resistances. It is shown theoretically and

graphically how this directing momentum depends upon the amount of external resistance and upon the frequency. The indicating force is in equilibrium with the directing force, the latter being simply a substitute for gravity or spring action. A special instrument is described very elaborately in which the measuring coil is arranged coaxially with the short-circuiting coil, a type which is particularly adapted as an indicating instrument for resistance bridges.—*Elektrotechnik und Maschinenbau*, Jan. 6, 1924.

Illumination

Problems in the Lighting of Printing Works.—L. GASTER.—Printing is a highly specialized and complex process involving the use of costly and elaborate machinery. Good lighting is, therefore, of vital importance, and its cost forms only a small fraction of the total operating expense. In rooms containing quick-running rotary presses, etc., there should be general illumination from overhead lights equipped with suitable bowls or reflectors well out of the normal range of vision of workers. The illumination on compositors' frames, make-up tables, layout surfaces, etc., should not be less than 5 foot-candles and should preferably exceed this value. In editorial and proofreading rooms the working illumination should be at least 5 foot-candles. *Illuminating Engineer* (*England*), Vol. XVI, No. 6.

Recent Developments in Nomenclature and Standards.—The report of the Illuminating Engineering Society committee on this subject sets forth the progress made during 1923 in the revision of the "Illuminating Engineering Nomenclature and Photometric Standards" previously prepared by the committee and approved as American standard by the American Engineering Standards Committee. This revision has been carried out with a view of making the recommendations of the committee practicable and applicable to the everyday work of the illuminating engineer.—*Transactions of the I. E. S.*, January, 1924.

Motors and Control

Winding Induction Motors.—M. SANDFIELD.—Practical notes are given on the armature winding for the engineer who rewinds his motors.—*Power Plant Engineering*, Jan. 15, 1924.

Electrical Equipment at Coal Mines.—M. S. BEDDOW.—Production delays are usually due to breakdowns which would not occur if the equipment had prompt and careful attention. The author points out the advantages of training motormen and hoist operators how to become thoroughly acquainted with all of the electrical apparatus which they operate.—*Coal Age*, Jan. 31, 1924.

Group and Individual Drives for Industrial Plants.—R. W. DRAKE.—The first of three articles that will analyze the advantage of group and individual drives, together with practical operating requirements and supporting data that have been developed from long experience in mill and factory work. The advantages of both types are listed in tabular form. The second article will go into details concerning the advantages of group drive and will give an actual comparison of investment and operating cost for each. The third article will discuss points that should be considered in the installation and operation of various drives.—*Industrial Engineer*, February, 1924.

Heat Applications and Material Handling

High-Frequency Electric Furnaces.—M. RIBAUD.—The author shows that the high-frequency induction furnace, known as Northrup type, possesses a number of advantages not found in any other furnace construction. The required single-phase alternating current of high frequency (15,000 cycles to 100,000 cycles per second) may be produced by a special generator or with an oscillating set. The latter may be of the open-spark type or of the atmosphere type with mercury arc in alcohol. The former is simple and positive, but costly, while the latter systems are inexpensive but are more complex and require careful attention. The efficiency of the furnace varies with the material to be melted, with the ratio between diameter and height of the crucible and with the frequency. It may reach as high as 56 per cent. Exact experimentally derived data are given to show to what an extent these factors determine the economy of such a furnace. In laboratory models temperatures of about 3,000 deg. C. can be easily and quickly reached. For example, it is possible to melt and to vaporize tungsten in a furnace of this type. The cleanliness, the speed with which highest temperatures may be reached and the universal use of one such furnace for various materials and melting processes are further advantages claimed for the high-frequency furnace.—*Bulletin de la Société Française des Électriciens*, November, 1923.

Investigation of Seam-Welded Rail Joints.—R. B. FEHR.—The author presents the results obtained from recent comparative tests of steam-welded joints and summarizes the principles that have been established. During the past two years an intensive investigation on this subject has been made along the following lines: (1) Careful study of the functions of seam-welded rail joints and the stresses to which they are subjected; (2) improvements in the joint structure and welding processes; (3) development of a practical method for making accelerated tests on seam-welded joints; (4) comparative tests on seam-welded joints. This thirty-five-page article discusses the investigations in detail.—*Journal of the American Welding Society*, January, 1924.

Tests of Elevator Interlocks.—In cooperation with the municipal authorities of Baltimore, the Bureau of Standards has been conducting some tests of elevator interlocking devices. A number of interlocks which had previously failed to meet the requirements were retested. One additional device met the test conditions, bringing the total number of those which have successfully passed the tests to seven. Included in this number are three interlocks of the mechanical and four of the electromechanical type. The successful results of the tests of these seven devices have been certified to the chief building inspector of Baltimore, who has formally approved them for use in that city by publishing an "approved list" of elevator interlocks.—*Technical News Bulletin No. 79 of the Bureau of Standards.*

Coal and Ash Handling Systems for Power Plants.—J. W. GEIGER.—The author describes the various types of ash and fuel handling apparatus, reviews the applications and limitations of the various types and considers the factors to be observed in the selection of an ash-handling system. Many of the larger power plants being built today use industrial cars for handling ashes from the ash-pit hoppers and conveying them outside of the building. Here they are in quite a few cases loaded into trucks, wagons or gondola cars by means of some type of crane.—*National Engineer*, February, 1924.

Traction

Mercury-Arc Rectifiers.—H. ODERMATT.—The latest achievements in the design of large-capacity rectifiers of the Brown-Boveri type are described and illustrated. A number of important mechanical and electrical design details are explained, such as, for example, a reliable stuffing-box construction for the lead entrances into the steel vessel, provisions to prevent backfire, etc. Stress is laid upon the advantage of rectifiers over rotating machines, especially in regard to overload possibility and high efficiency at low loads and high voltages. A rectifier of a certain size has, for example, 96 per cent efficiency for 500-volt direct current, 98 per cent for 1,000-volt and 99 per cent for 2,000 volt. In a 1,200-kw. substation for an electric railway equipped with a rotary and a rectifier it was found that the losses of the rotary per day were 650 kw.-hr. more than those of the rectifier, which amounts in a year to 25 per cent of the cost of the rectifier. The ease with which the rectifier covers very heavy overloads of short duration makes the installation of a floating buffer storage battery unnecessary. This is of great importance for traction, rolling-mill motors, cranes or any other fluctuating loads. A number of rectifier installations in Switzerland and other countries are described and illustrated. A total capacity of 140,000 kw. in this type of rectifier is installed, distributed in 230 individual plants.—*Bulletin de l'Association Suisse des Electriciens*, December, 1923.

Experimental Locomotives for Pennsylvania Railroad.—Three experimental 200-ton electric locomotives have been built for the Pennsylvania Railroad, one for freight service on alternating current and two for passenger service on direct current. Each locomotive has four 760-hp., single-phase, commutator-type motors connected to the driving wheel by side-rod construction. The motors and mechanical parts are identical to give interchangeability on both the alternating-current and direct-current locomotives.—*Electric Railway Journal*, Jan. 26, 1924.

News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rulings and News of Electrical Men

Tennessee Electric Power Company Wins

Merger of Power Companies Not a Trust, the Chancery Court at Nashville Declares, Nor Is Electricity "Domestic Raw Material"

THE consolidation of middle and east Tennessee power companies into the Tennessee Electric Power Company is not in violation of the Tennessee anti-trust laws and the common laws, according to an opinion delivered Friday, February 15, at Nashville by Chancellor James B. Newman of the Chancery Court.

The decision was made in the case of State of Tennessee versus the Nashville Railway & Light Company, Chattanooga Railway & Light Company, Chattanooga & Tennessee River Power Company, Tennessee Power Company, Tennessee Railway, Light & Power Company, Tennessee Electric Power Company and the Nashville Trust Company. The bills attacked the contracts and agreements entered into by the defendant companies for the purchase by the Tennessee Electric Power Company of the other power companies as being illegal and sought to have the contracts declared void and the charters of the utility companies forfeited.

The court held that electricity is an article or product which is manufactured and is not an article of domestic growth or an article manufactured from "domestic raw material" within the meaning of the anti-trust law.

ELECTRICITY NOT RAW MATERIAL

"Electricity as an energy or force in nature is not susceptible of ownership, and therefore not 'domestic raw material,'" the court stated. "There can be no agreement or combination made to lessen or which would tend to lessen competition in the sale of electricity as an energy or force in nature. Until it is generated or manufactured it is not a subject of property rights, and since it is not manufactured from domestic raw material,' it is not within the statute invoked."

The court further held that the agreements entered into between the defendants are not against the public policy of the state nor interdicted by any principle of common law in force there. It held that legislation passed in Tennessee since the enactment of the anti-trust law permits corporations, except competing lines of railroad, to lease and dispose of their property and franchises to other corporations engaged in the same business, empowers corporations to sell, transfer and convey their property and franchises to other corporations, and gives the Public Utilities Commission of the State of Tennessee authority to supervise, regulate and control public utilities, their property, facilities and franchises.

By the provisions of the law, said the court, no public utility may lease its property, rights and franchises or merge or consolidate with any other public utility, or construct or operate any line in any territory receiving like service from another public utility, without first obtaining a certificate from the Public Utilities Commission that the present or future public convenience and necessity require such construction or operation. It appeared, the court stated, that all agreements and contracts of the defendants had been ratified and approved by the Public Utilities Commission, and the decision went on to declare:

"It is difficult to reconcile with reason or simple justice that the state would authorize a corporation to do certain acts, provide a commission or tribunal to pass upon and approve these acts, and then punish the corporation by forfeiture of its charter and banishment from the state for what it had sanctioned and approved."

C. M. Clark, chairman of the board of the Tennessee Electric Power Company, said: "The decision naturally is gratifying, but it was not unexpected as the legal question at issue received careful attention when the company was formed and no apprehension was felt as to the outcome of the action."

Federal Court Upholds Twenty-Year Intercompany Pact

In a finding recently handed down by Judge Brown of the United States District Court in Rhode Island the Attleboro (Mass.) Steam & Electric Company is authorized to draft a decree for an injunction against the Narragansett Electric Lighting Company, Providence, R. I., to insure the continued supply of energy from the latter to the former under the terms of a contract entered into in 1917 and having a life of twenty years. In 1921 the Narragansett company applied to the Rhode Island Public Utilities Commission for authority to charge the Attleboro company an increased rate on the ground that the 1917 contract was proving unprofitable, and a new tariff based upon periodic costs of production and delivery was submitted. The commission approved the new schedule, but the Attleboro company carried the case to the courts, demanding that the Narragansett company abide by the contract. The Narragansett company contended that it would be unjust to supply energy to the Attleboro company at rates less than those charged in Rhode Island.

The federal court finds that there is no principle imposing an obligation upon a state commission to regulate rates merely to relieve a contracting party from a burdensome contract; that it was not shown that the continuance of the contract would be adverse to the public interest in Rhode Island, and that its abrogation with cessation of energy supply to Attleboro would constitute a disaster to the latter community. Legislative power to set aside contracts, unless in the public interest, is precluded by the contract impairment clause of the United States Constitution.

Danger of April Coal Strike Seems Averted

A renewal of the present bituminous miners' wage scale for three years was agreed on by the joint conference of miners and operators of the central competitive field held at Jacksonville, Fla., this week. This field takes in the mines of Illinois, Indiana, Ohio and western Pennsylvania, and its acceptance means that in all probability there will be no strike of soft-coal miners on April 1. The agreement, however, must first be submitted to a referendum of the United Mine Workers, bituminous and anthracite.

The outcome is a compromise between the miners' demand for a four-year contract and the operators' offer of a renewal for the customary one year. It is counted a victory for the miners because wages and conditions will remain as they have been since the strike of 1919, but the extended term should have a stabilizing influence on the coal-mining industry.

Water and Power Act to Come Up Again in California

An initiative petition to place again on the referendum ballot in California an act designed to place the light and power industry of the state under public ownership will be circulated in the near future in that state. It is understood that the act will be almost identical with the measure which was defeated in 1922 by a vote of about three to one. That act provided for the issuance of bonds up to half a billion dollars for the purpose of constructing, purchasing or condemning light and power systems in the state. The administration of the act was to be in the hands of a board of five to be appointed by the Governor.

White River Site Dispute

Lower Niagara Development, California Dams and Other Things Are Before Power Board

COPIES of his certificate of convenience and necessity and of an option given the Hugh L. Cooper Company have been filed with the Federal Power Commission by Walter Powell, the president of the Dixie Power Company, who has been trying for twelve years to further the development of a 100,000-hp. site on the White River in Arkansas. Mr. Powell obtained a preliminary permit on March 3, 1921, and is about to request a license. The Hugh L. Cooper Company is acting in this matter as the trustee for the North American Company. In that connection a conflicting application was filed for a preliminary permit covering that stretch of the river included in the Dixie Power Company's project. The Cooper application was rejected by the Federal Power Commission, which led to the agreement with Mr. Powell. The action just taken by Mr. Powell indicates a disagreement between the parties at interest, the extent and effect of which will be revealed, it is believed, when consideration is given the application for the license.

The Lower Niagara Power & Water Supply Company, a subsidiary of the Niagara, Lockport & Ontario Power Company, to which a preliminary permit was issued March 3, 1921, has announced that it will file an application for license prior to the expiration of its preliminary permit on March 3. In connection with this application the State of New York has raised a question as to the company's state authorization for the development. The company, however, contends that it has satisfactory authority from the state. This will be one of the points which the commission will pass upon in connection with the consideration of the license.

This project will assume increased importance in the near future because virtually all of the power now available in this region has been absorbed. This, together with the indications of long delay in bringing about additional diversion from the Niagara River, has stimulated the movement to develop the immense power resources on the American side of Niagara gorge.

California and Other Projects

Revised plans for the proposed high dam in the Merced River at Exchequer, Cal., have been approved by the commission. The dam is to be 320 ft. high. The plans provide for a gravity arch dam similar in design to the Arrow Rock dam built by the Reclamation Service in the Boise River.

New plans for the dam in connection with the development of the Pacific Gas & Electric Company's Pit River No. 3 project have been approved. The first plan provided a rock-filled dam. The new plan calls for one constructed of concrete.

Maxfield, Earnhart & Ward have withdrawn their application for a preliminary permit covering a power development at United States Dam No. 1 in the White River near Batesville, Ark. This action followed the report of government engineers to the effect that the project is of doubtful feasibility.

A declaration of intention has been filed by the Public Service Company of Northern Illinois, which wishes to develop a small site at Aroma Park, Ill., near the mouth of the Kankakee River.

Petersburg, Alaska, has informed the commission of its intention to begin the construction of its municipal hydroelectric plant.

Home Rule and Commission Rule in New York

A final public hearing on the enabling act to be introduced in the New York State Legislature in order to give effect to the home rule amendment to the constitution carried at the general election last fall will be held on February 25 in New York City. The first draft of this act gave certain regulatory powers to cities over public service corporations and implied that a city having the right under its charter or by existing law to own and operate a public utility might do so and might create a debt of the city for such purpose without referendum to the people. In the revised draft this authority remains, but a new section provides that any change relating to public utility franchises must be submitted to the people.

A provision of the bill as it now stands which in the opinion of some representatives of utility companies needs to be elucidated is one under the classification "supplemental powers" which includes among such powers the authority "to adopt a local law repealing a local law or state statute, which, pursuant to this chapter, it is authorized to adopt or amend." This clause, it is held, might be so construed as virtually to enable municipalities to get from under the operation of the Public Service Commission law entirely without the necessity of a bill for the repeal or amendment of that law first passing the Legislature.

Colorado River Hearing Unproductive

Power Company Representatives Not Yet Called, Though Their Organizations Are Attacked by Head of Boulder Dam Association—Los Angeles' Future Thirst

HEARINGS on the Colorado River bill are being continued in Washington before the House committee on arid lands. Though the committee invited the appearance as witnesses of a number of persons who are presumed to represent owners of Mexican lands and of officials and representatives of various power companies which would be affected by the bill, these gentlemen had not been examined at the time of this dispatch from Washington. Much stress was laid by members of the committee last week upon their desire to examine George L. Hoxie, consulting engineer of the Southern California Edison Company, who is in Washington at this time, but although he has constantly attended the hearings, he has not been called as a witness.

S. P. Evans, Mayor of Riverside, Cal., executive officer of the Boulder Dam Association, was one of the principal witnesses. He read into the present record many extracts from the hearings of last year. The names of the Southern California Edison Company, the Holton Power Company, the California-Nevada Power Company and the Southern Sierras Power Company were thus recorded as being opposed to the development of the Colorado River except by private capital. This procedure has caused the chairman of the committee, Representative Addison T. Smith of Idaho, to express the opinion that "the hearings are not getting anywhere."

William Mulholland, chief engineer of the Los Angeles Department of Public Service, on Friday of last week threw an entirely new element into the situation when he said that the future existence of Los Angeles would depend upon its augmenting its present city water supply by drawing upon the Colorado River. Mr. Mulholland was questioned by the committee all day and pointed out that the drought of the present year had thrown the city of Los Angeles into a frame of mind to do anything, no matter how desperate it might be, to assure a water supply to the larger Los Angeles which is coming. Mr. Mulholland, who has a long familiarity with the situation, said that the water would have to be carried over a mountain range, involving its elevation by pumping at least 1,200 ft., and that this would mean the utilization of 200,000 hp. in the Boulder Canyon power plant, if built. In other words, according to Mr. Mulholland, Los Angeles offers to become a permanent customer of the plant to that extent. It was, however, developed by examination that the present water supply, except in periods of extreme drought, could easily take care of a population of two million, more than twice Los Angeles' present population. Committee members pointed out that it should first be proved an impossibility to get water from the Pacific Coast watershed before allowing any city to take water out of the Colorado River basin, especially at the expense of one-third of the total capacity of the Boulder Canyon power house. Some members of the committee tried to draw from Mr. Mulholland whether he thought there was any organized opposition to the building of the dam at Boulder Canyon. He said opposition was scattered and unorganized.

Mr. Mulholland further said that the paramount purpose of any construction on the Colorado River at the present time is, of course, the protection of the Imperial Valley and also that a 400-ft. dam on Boulder Canyon was sufficient for this purpose. Any construction above this height would be merely for the purpose of power development, irrigation, or to guarantee the dam longer life before silt fills its basin.

Consumers' Power Plans

Budget of $15,000,000 Provided for 1924 —New Hydro Plants and Addition to Steam Installation

THE Consumers' Power Company, whose headquarters are at Jackson, Mich., will spend $15,000,000 on construction work in Michigan during 1924, according to an announcement by C. W. Tippy, vice-president and general manager. "This is almost exclusively an investment in better service for our customers," declared Mr. Tippy. "Michigan is growing rapidly, and its industrial expansion is so rapid that it is a problem to keep ahead of the demand for power. Naturally a good portion of the $15,000,000 spent in Michigan this year will go toward increasing our power resources both in the shape of added steam and water power and also in transformer and transmission-line improvements.

"Included in this appropriation are provisions for the completion of the new 8,000-kw. hydro-electric plant on the Au Sable River and for the preliminary work on the county line dam near Cadillac on the Manistee River. The county line development will be the Consumers' Power Company's second largest hydro-electric plant. The 1924 appropriations also include provisions for the completion of the Saginaw River steam plant, which will have an initial capacity of 40,000 kw., but with a designed ultimate capacity of 100,000 kw. Another addition to our steam-power resources is the new 20,000-kw. turbo-generator unit at the Elm Street plant in Battle Creek.

"Completion of the Fulton Street combination steam-heating and turbo-electric plant in Grand Rapids is provided for in this year's estimates. This is a modern steam-heating installation with high-pressure boilers which feed into bleeder-type turbo-generators. Steam at 100 lb. for the high-pressure heating system is taken out at one point, and the turbines exhaust at a pressure of about 5 lb.

Transmission-Line Extension

"We plan to build in Michigan about 150 miles of transmission lines during 1924," Mr. Tippy said. "One item of $750,000 is for transmission lines to connect our U-shape superpower system with the water-power plants of the Wolverine Power Company, which is developing the resources of the Tittabawassee River and all of whose power we take under contract. Another transmission line will be built from these developments to Alma, the distributing point for the central district of the Consumers' Power Company, formerly the Central Michigan Power Company. Another transmission line will extend southward from Battle Creek to tie in the new southern district of the company, of which the nucleus was the old United Electric Company. This utility was recently purchased by the Consumers' Power Company as the beginning of the comprehensive development of the district lying south of Kalamazoo and Battle Creek.

"Some idea of the growth of business in Michigan and the demand for electric service may be gleaned from the fact that the estimates for 1924 are for 25,000 new customers. The company closed 1923 with 180,785 electric customers. During the year just past the company repeatedly exceeded all past records for peak loads on the system, even the high points of the war days. The peak for 1923 was nearly 150,000 kw. In that year the company sold 574,031,472 kw.-hr. Of this, 290,484,279 kw.-hr. was generated from water power. It has been estimated that this energy from the state's water power conserved for other essential needs about 500,000 tons of coal.

"About $2,500,000 of the $15,000,000 will be devoted to improvement and extension of the distribution system. Many of the communities the company serves will be so completely revamped as to represent almost a rebuilding operation. A considerable investment will be made in modern switching equipment, and not the least important item is the provision for automatic voltage regulators. At several points duplicate transformer banks are to be installed in the interest of service continuity. Nearly the entire investment is to be devoted exclusively to an effort to give customers a higher degree of efficient and satisfactory service."

Valuation Expert Opposes the Amortization of Discounts

A defense of "structural overhead" and "going value" as elements in the valuation of public utilities and of mergers, particularly of electrical properties, even if high prices be paid by the merging company, was made by Carl H. Mote in an address before the Century Club of Indianapolis recently. Mr. Mote formerly was secretary of the Indiana Public Service Commission and now is attorney for some of the utility companies.

He also criticised the practice of some of the public service commissions in requiring, when securities are sold at a discount, that the discount be amortized out of the net income. The latter practice will "ruin utilities," Mr. Mote said, and is a bad policy for the state as well as for the utilities. He maintained that discount is really a part of the cost of money for utilities and suggested that a better practice would be to require the utilities to set aside each year from their gross income an amount to cancel the discount. The same end, he added, could be attained by requiring the amount of discount to be reinvested in additions for which no securities could be authorized or issued.

Mr. Mote said further that the return utilities have actually received is in many cases less than public service commissions estimated when rates were authorized. It is absurd, in his opinion, to say that "structural overhead" is imaginary, and he sought to show that it is an actual cost in the construction of utility property. He analyzed items entering into "structural overhead" and said that "going value" is a proper item in finding the value of a utility property. Because of a lack of records in many cases showing actual cost of property, the estimated reproduction cost method was the best available, although original cost should be considered where it can be found. There is greed and avarice among utility owners, he said, "but it is no more common in this field than in any other."

Many mergers of electrical properties have been made, Mr. Mote said, and though high prices have been paid for these properties in some instances, the public already has benefited by reduced rates because of economies in large central plants and transmission lines.

Alluding to criticism of the Indiana Public Service Commission, the speaker observed that he had "come to regard much of this public criticism as uninformed, somewhat ill-tempered and given to an exaggeration of facts."

Power Company Gains

Narragansett Electric Has Prosperous Year—Other Utilities Report an Advance in 1923

REMARKABLE progress in both commercial and operating development is recorded in the report of President E. A. Barrows of the Narragansett Electric Lighting Company, Providence, R. I., for 1923, recently submitted to stockholders. The gross revenue has increased from $1,670,000 in 1914 to $6,636,000 in 1923. During 1923 the company generated 359,746,610 kw.-hr., a gain of nearly 30 per cent over 1922. The output last August was nearly equal to the entire production of the year 1913. There are now 71,554 customers on the books, and of these many are stockholders. During the year there was a gain of about 2,700 stockholders, and 1,666 of these were added in a sale last spring to customers not already shareholders, on the basis of not over five shares per applicant. The company gained 11,484 customers in 1923. Ten years ago the total number of customers was 22,125. On the operating side the occupancy of the new Melrose service station, construction of a new switch house at the Eddy Street station and progress toward changing over the 250-volt lighting system to 104 volts mark the period.

Good Financial Reports from All Regions

The Niagara Falls Power Company reports net income of $2,562,386 for 1923, as against $2,394,407 earned in the previous year. Earnings of the common stock were equal to $8.39 per share on $17,324,400 of stock outstanding.

The Consolidated Power & Light Company of Huntington, W. Va., shows net income for 1923 of $826,999 against $1,017,115 in the previous year.

The Arkansas Light & Power Company reports a net income of $374,034 for the year, which compares with $284,308 earned in the previous year.

The Carolina Power & Light Company reports a balance for the common stock, after preferred dividends, of $503,477 in 1923. This compares with $412,790 in the previous year.

The San Joaquin Light & Power Corporation reports net income, after depreciation, of $1,451,311, as against $1,220,913 in the year before.

American Engineering Council Changes

Vice-President G. S. Williams Outlines the New Plan of Organization and Announces the Alterations Made in the Constitution, Bylaws and Standing Rules

THE organization of the American Engineering Council constitutes a federal system analogous to that under which the government of the United States functions, according to a statement interpreting the council's revised constitution prepared by Gardner S. Williams of Ann Arbor, Mich., a vice-president of the council. The new constitution permits the re-election of the president, an office now occupied by former Governor James Hartness of Vermont. The statement of Mr. Williams follows:

"The first change in the revision is the dropping of the name 'Federated American Engineering Societies' and replacing it by 'American Engineering Council,' which now stands for the association of societies. The administrative and legislative body formerly called the American Engineering Council is now designated the assembly. The name of the executive board is changed to administrative board, and the committee on procedure becomes the executive committee.

"By way of analogy it may be said that the constituent societies correspond to the states in our national government and like them have delegated certain powers to a national organization. This organization, the American Engineering Council, therefore corresponds to the United States. The assembly then is analogous to Congress, and the administrative board may be said to represent roughly the President and his Cabinet. It may be pointed out that by reason of the method of selecting delegates to the assembly the latter partakes of the nature of a Senate rather than a House of Representatives, while in its representation proportioned to membership it resembles the House rather than the Senate.

"The next change is in the provision for membership whereby it is made possible for technical sections or divisions of non-engineering organizations to be admitted, as well as alumni associations of engineering schools and sections of non-member national societies, none of which seemed to be included under the original constitution.

"The assembly is specifically directed to 'communicate through appropriate channels to the proper representatives of the national government opinions, advice and suggestions relative to questions of legislation or administration in the solution of which engineering and allied technical knowledge and experience may be involved or valuable,' and it is authorized 'upon request of local or state organizations, or in the absence of such organizations, to render similar service in local and state affairs.' The former function has been regularly exercised by the council since its organization, but was never specifically provided for in the constitution.

"The past-presidents are made members of the assembly for six years following the expiration of their service as presidents, in order that their judgment and experience may be available to the council.

"A provision is introduced making possible a reduction of membership on the administrative board below thirty, the former requirement.

Executive Restrictions

"The most important change is in Section 2 of Article IV, wherein the established practice of the council is written definitely into the constitution as follows:

" 'Limitations.—No decision affecting the policy or action of the American Engineering Council shall be made by the general assembly or the administrative board unless it shall receive a two-thirds affirmative vote (a) of the representatives present of each of the national member societies having six or more representatives on the assembly; (b) of the aggregate of the representatives present of the other national member societies; (c) of the aggregate of the representatives present of the local, state and regional member societies.

" 'These limitations shall not apply to the election of officers, the eligibility of representatives, the admission of members, the determination of assessments, the payment of bills, the adoption of a budget, the amendment of the bylaws or standing rules, the selection of a place and time for a subsequent meeting, or matters of a purely routine nature.'

"This provision prevents any hasty or ill-considered action being taken over the opposition of even a comparatively small minority and assures substantial unanimity on all matters of major importance. It gives to each of the large national societies the power to stop action and should fully answer the charge that they may be swamped by the votes of the smaller local societies.

"The old provisions regarding the setting up of state councils and relations to state affairs have been dropped.

"The bylaws now appear as 'bylaws and standing rules.' The former embrace those practices which have been established, while the latter include matters upon which a final conclusion has not yet been reached. The former can only be amended by a vote of the assembly, while the latter can be changed by the administrative board.

"The membership is now restricted to organizations 'of the United States,' it being recognized that the council's functions are primarily to deal with our national government from the standpoint of its citizens and that there can be no proper participation of foreign societies therein.

"A qualification for representatives on the assembly has been inserted which is practically equivalent to that of the second grade of corporate membership in the great national societies. This assures on the assembly men of similar qualifications to those met in the governing bodies and on the committees of the national societies.

"In the standing rules provision is made for alternates both on the assembly and the administrative board, it being the belief that the more persons who can be brought into close touch with the work of the council the more strongly will it become intrenched in the engineering profession."

New Dam of Waterloo (Iowa) Central Station

A DAM across the Cedar River at Waterloo, Iowa, was recently completed at a cost of $300,000 for the Citizens' Gas & Electric Company of that city, to take the place of a fifty-year-old structure battered to pieces by high water in 1922. Although the dam adds only 1,100 hp. of hydro-electric power to the 30,000-hp. generating capacity of the company's present steam plant, it assures a dependable water supply to this power house. One of the features of the dam is an air compressor installed in the operating pier. Pipes are laid along the bottom of each gate, and in freezing weather the ice that would form around the edges is blown away. The Citizens' Gas & Electric Company is planning to erect another plant at Waterloo this year.

Camp Co-operation IV Assured

In accordance with a resolution passed at Camp Co-operation III, in which the Society for Electrical Development was asked to arrange another conference of local electrical league representatives in 1924, arrangements have been made with the Association Island Corporation making the facilities of the island available for the purpose. At its annual meeting on February 5 the board of directors of the society authorized the inclusion in the budget of an amount to take care of the society's part of the expenses of the meeting and directed the management to arrange all details.

Preliminary notice has been sent to the officials of local electrical leagues throughout the country advising them of the dates of the meeting, September 2 to 6 inclusive, and asking their co-operation in making the meeting a success. The necessary committees are in process of formation, and preliminary meetings will be held about the time of some of the national conventions. This, it is thought, will insure a most constructive conference.

Further announcements will be made from time to time. Those interested should communicate with the society at its headquarters, 522 Fifth Avenue, New York.

L. D. Gibbs Broadcasts Edison Birthday Address

On Monday evening, February 11, the seventy-seventh anniversary of the birth of Thomas A. Edison, an address in celebration of the occasion was broadcasted by L. D. Gibbs, chairman of the public speaking committee of the National Electric Light Association. Among other things Mr. Gibbs said:

"Through the greater part of his life Mr. Edison paid no attention to the forms, customs and routines of business. He has paid no attention to anything that did not have to do with a better and more effective use of the forces of nature in our civilization. He visualized the need of a device for recording the spoken word, and the phonograph was born. He visualized the need of a small unit in order to adapt electric light to general uses, and while a wise scientist in London was saying that the great electric arc lamp would never be practical for general use, and there was no evident field for electric lighting, the incandescent electric lamp was born. Mr. Edison had seen the existing difficulty, visualized the need, and while the newspaper was being circulated that carried the London scientist's statement Mr. Edison was bringing out the incandescent lamp. After inventing the lamp, he developed the system for distributing electricity to small units and developed the electric dynamo for generating the electricity.

"Standing in a narrow New York street jammed full of horse-drawn trucks with all the consequent delays and turmoil, Mr. Edison visualized the elimination of the horse-drawn vehicle and the substitution of the electrically driven truck. Thus, through all his long life Mr. Edison has been working to eliminate time and space and open for the enjoyment of civilization the great field of undiscovered and undeveloped forces."

Milwaukee Company Opposes Lake Michigan Diversion

A communication from the Milwaukee Electric Railway & Light Company to Secretary of War Weeks and Wisconsin senators and representatives protests vigorously against legislation by Congress to sanction the diversion of water from Lake Michigan at Chicago through the Chicago Drainage Canal. Any such diversion, the company claims, threatens the continued operation of the company's 130,000-kw. pulverized-fuel steam-power station at Lakeside.

This plant requires large quantities of water for condensation purposes and has no source of water supply except Lake Michigan. Normally the tunnel through which the supply is taken in is 5 ft. below the lake level. Engineers of the company warn that the lake level has now fallen to within 1.93 ft. of the top of the tunnel. It is pointed out that if Chicago is successful in its efforts to obtain from Congress legalization of the diversion of a greater quantity of water than is now being taken, the consequences to the Lakeside power plant may be disastrous. The company has in Lake Michigan a basin, 750 ft. by 450 ft., inclosed on all but the shore side by a granite-covered rubble-mound breakwater. Water is drawn from this basin through a concrete tunnel of 10 ft. inside diameter and 600 ft. in length and returned to the lake after use.

The Lakeside power plant is the principal supply of electrical energy for all the territory within 80 miles of the southern boundary of Wisconsin and 50 miles of the west shore of Lake Michigan, and more than a million persons would be affected were its railway, lighting and power service crippled.

Chicago Urges Bill Authorizing Its Use of Lake Water

A new effort is to be made at this session of Congress to secure authorization for the diversion of 10,000 cu.ft. of water per second from Lake Michigan at Chicago. The bill provides that the cost of regulating works intended to restore and maintain former water levels in the Great Lakes and their appurtenant rivers is to be borne by the Sanitary District of Chicago and specifies the St. Clair River, the Niagara River or the St. Lawrence River as the site of the proposed works.

The Corps of Engineers did not report favorably on this bill when it was referred to that agency at the last session of Congress, and it was not reported out of the committee on rivers and harbors. If the United States Supreme Court sustains the lower court in a case now on appeal, the Sanitary District will have to reduce its present diversion from 10,000 cu.ft. per second to 4,167 cu.ft.

New York Edison Opposes Commission Hearings

In a communication filed with the Public Service Commission, in the matter of the complaint of Mayor Hylan of New York City against the rates, charges and classification of service of the New York Edison Company, counsel for the company take the position that the complaint "lacks any semblance of merit," that it will put an enormous burden of useless expense upon the commission, and so upon the taxpayers, as well as upon the New York Edison Company and its consumers," and that the commission, under the law, does not have to conduct expensive and tedious hearings because a complaint is filed. The communication was taken under advisement without decision by the commission, which, however, has sustained the right of the city to appear as a complainant.

"We believe," the communication says, "that the present rates are so low as to be confiscatory, as a matter of fact and of law, under the recent decisions." In addition, the company asks that the commission assure itself of the justice of the complaint before committing itself to public hearings the conduct of which would cost the New York Edison Company alone upward of $500,000.

The Edison company has also informed the commission that to no representative of the city will access to the company's stations, properties, books or accounts be allowed.

Paris to Increase Its Light and Power Plants

Paris has experienced during the past few months a shortage of electrical energy which has seriously interfered with the operation of the underground lines of transportation in the French capital and with the production of light and power. The 45,000-kw. generators of the Gennevilliers plant are said never to have been able to furnish their rated power. The Vitry central station, which was intended to be used as an emergency or standby plant, but which, it seems astonishing to say, has never been properly protected against floodwater in the Seine, went out of business during the floods at the beginning of the year. A call was made at that time on the Saint-Denis plant for help. Already working at full head, this plant burned out three of its generators just at the height of the crisis.

The upshot of these conditions is that Paris has a pressing electrical problem to solve. The city and suburbs daily ask more than the present facilities can supply. The output within the fortification walls was 200,000,000 kw.-hr. in 1921 and 352,000,000 kw.-hr. in 1923. The probable demand for 1930 is estimated at 800,000,000 kw.-hr. The Saint-Denis plant, which is operated as an auxiliary of the Gennevilliers station, can actually generate at the present time only 60,000 kw. It is to be expanded until in 1925 it will be able to furnish 220,000 kw. New plants are imperatively demanded, and these will probably be placed on the banks of the Seine.

Oklahoma Bill Provides Revocable Permits for Utilities

Salient features of a bill introduced into the State Senate of Oklahoma are:

1. A 1½ per cent annual tax on gross receipts payable to municipalities on business done within their borders by public utilities operating under provisions of the bill.

2. Provision whereby public utilities holding municipal franchises may operate under "standard service" or revocable permits, which are defined as follows: "The standard service or revocable permit, erroneously called an 'indeterminate' franchise, is merely the right to exist and do business subject to all the laws of the state during good behavior and until purchased, condemned or taken for public use—a right common to all property owners except a very few public utilities."

3. Preservation of all existing police powers of cities over public utilities.

4. Preservation of rights of cities to engage in any business now authorized by law.

This bill extends to other classes of utilities substantially the provisions of the public convenience and necessity law adopted by the Legislature in 1917, which was applicable only to telephone companies, but which included no tax feature.

No utility can ask for a revocable permit unless it shall have first obtained a municipal franchise. Where utilities hold franchises in municipalities, the bill contemplates that such franchises may be surrendered if utilities are willing to assume the obligations imposed by the proposed bill.

It is pointed out that higher interest charges have been made against Oklahoma's utility securities by reason of the necessity for financing over short periods. The proposed bill contemplates a saving in financing utilities which its sponsors feel should be passed on to the public through the 1½ per cent payment to city treasurers. It is further felt that this measure will provide an indirect tax payment by many citizens who now pay no ad valorem tax whatever.

Plans of California Co-operative Campaign for 1924

Plans for the California Co-operative Campaign's activities during 1924 cover the continuation of the wiring program, which includes calls on architects, builders, real estate agents and owners and the distribution of wiring plans and specifications; continuation of the "electric home" program; addressing women's clubs on the subject of lightening household labors by the introduction of electricity into the home; continuation of the portable window-lighting exhibit; taking an active part in the "lighting schools" and the "lighting month" which the Lighting Bureau of the Pacific Coast Electrical Association is undertaking; promotion of the "June bride week" sales campaign and other timely drives, making an electrical census to ascertain the number of persons employed in the electrical industry and continuation of the co-operative work among its four branches.

Funds aggregating $50,000 have been pledged to carry on the work of the campaign, divided as follows: Manufacturers, jobbers and contractors, $20,000; power companies and retailers, $30,000.

Riparian Owners Oppose Power Company

The New York Public Service Commission will give a hearing next Wednesday on a petition from the Niagara, Lockport & Ontario Power Company of Niagara Falls, which seeks to obtain the rights of eminent domain over certain power sites on the Salmon River in Oswego County. The company has already large developments on part of this river.

The petition represents the first application of an amendment to the conservation law of 1922, and there is said to be a difference of opinion in the Public Service Commission as to the scope of the law. By obtaining the right of eminent domain the power company could acquire, under condenmnation proceedings, power sites of 153 riparian owners along the Salmon River, and these owners, who claim that their sites are capable of producing 45,000 hp., are fighting the application.

Should the company win, its opponents maintain, all smaller owners of riparian rights throughout the state might be required to deliver them to the owner of the major part of any power sources. One contention of the Salmon River owners is that the state must be part owner of the riparian rights to make the law operative.

Fuel-Oil Sources Exaggerated, Declares Dr. Smith

Bituminous coal will remain the chief dependence of this country in electrical energy production for centuries to come, declared Dr. George Otis Smith, director United States Geological Survey, at the eighth annual banquet of the Providence (R. I.) Engineering Society, on February 5. Great as are our potential water resources, these would prove insufficient to carry more than a small fraction of the power load east of the Mississippi River, "and oil," said Dr. Smith, "with all its obvious economic advantages, must be recognized as the little sister of coal and pitifully short-lived. Last year was oil's boom year, and yet, the fuel-oil capacity of the American wells at the crest of their flood was only one-sixth or one-eighth of the output of the bituminous-coal mines. Rhode Island public utilities," Dr. Smith continued. "carry all their increased load with fuel oil, and their oil consumption is now about 10 per cent of that used by all the public utilities of the country. Fuel oil cannot carry the load of the whole country, and the increase in its use in power plants even last year was far less than the increase in the use of coal. Geologists estimate that 40 per cent of our oil reserve has been exhausted but less than 1 per cent of our bituminous coal."

Briefer News

Joint Meeting of Engineers to Discuss Superpower.—Under joint auspices of the A. I. E. E. and the A. S. M. E. "The Real Meaning of Superpower and Its Relation to Railway Electrification" will be discussed by W. S. Murray on Wednesday, February 27, at 8 p.m., in the Engineering Societies Building, New York.

Fall Convention of New England Division, N. E. L. A., Set for Portsmouth, N. H.—The sixteenth annual convention of the New England Division of the National Electric Light Association will be held at the Hotel Wentworth, Portsmouth, N. H., Sept. 10-13 inclusive.

Two More Vehicle Lectures in N. E. L. A. Course.—Two more lectures remain to be given in the N. E. L. A. electric vehicle course, given in New York. February 29 W. V. C. Brandt, General Electric Company, Lynn, Mass., will talk on "Batteries," and on March 7 there will be discussions by K. B. Jones, General Electric Company, New York, on "Charging Equipment," and by P. F. Karst and George Ford on "Truck Operation and Maintenance."

Eastern and Western Divisions of Oklahoma Utility Connected.—The 90-mile, 66,000-volt power line between Covington and Drumright, Okla., has been completed and now joins the eastern and western divisions of the transmission system of the Oklahoma Gas & Electric Company. The system now supplied by this company includes more than 400 miles of transmission lines. With the completion of a connecting line between Harrah and Shawnee, it will extend from Paul's Valley, through Shawnee, Oklahoma City, El Reno and Muskogee, to Fort Smith, Ark., with extensions from the main line to Norman, Poteau and Havener.

Lake Superior District Company Expansion.—The Lake Superior District Power Company of Ashland, Wis., has finally purchased the Washburn Electric Light & Power Company. This, with the acquisition of the Medford Light & Heating Company previously announced, adds 1,300 light and power customers to the Lake Superior District company's system.

Five Florida Companies Merged.—W. S. Barstow & Company have organized the Florida Public Service Company, which has taken over from local owners the properties of the Orlando Public Service Company, Orlando Gas Company, Florida Ice & Power Company, DeLand Electric Light, Power & Ice Company, and Eustis Light & Water Company. The combined company supplies electric light and power in twenty-one communities in central Florida, including De Land,

Eustis, Travers, Winter Park, Davenport, Haines City, Dundee, Lake Wales, Mount Dora, Frostproof and Avon Park.

Interstate Power Company Buys Another Plant.—Acquisition of the plant and distribution system of the Blue River (Wis.) Light & Power Company by the Interstate Power Company of Chicago is announced. The Interstate company supplies many cities and towns in southwestern Wisconsin and northeastern Iowa.

Davenport Pushing Its New Station.—Purchase of an additional $200,000 worth of equipment for the superpower plant which the United Light & Railways Company is erecting on the Iowa shore of the Mississippi River east of Davenport is announced by President B. J. Denman. This order calls for four transformers, rated at 60,000 kw., bought from the General Electric Company, and oil switches and a 1,500-kw. turbine for auxiliary use, purchased from the Westinghouse Electric & Manufacturing Company. Delivery in ten months is provided for. The equipment is for the first unit of the ten-million-dollar plant eventually to be completed.

Mullan-Burke Interconnection Completed.—The new 110,000-volt connecting link between the lines of the Washington Water Power Company and the Montana Power Company in the Cœur d'Alenes was recently tested and the whole line is now about ready for use. Although only 7 miles long, it represents the most difficult type of mountain construction, the rise in elevation being 1,000 ft. As stated in a previous issue, this line starts at the Mullan Junction substation of the Washington Water Power Company and runs to the Burke substation of the Montana Power Company. It will permit either company to feed the other with energy up to 15,000 kw.

Bringing the Factory to the Power Source in New South Wales.—The first large step in the development of hydroelectric energy in northern New South Wales is being taken under the direction of Armstrong, Whitworth & Company of London. The site of the power house is on the Clarence River near the township of Nymboida, and the estimate of the capital cost of the work is £100,000. Energy will be generated at 6,000 volts and stepped up to 33,000 volts for transmission along the Clarence. The plan is a part of a movement to counteract the tendency to centralize industrial undertakings in large cities and to bring the factory nearer to the source of raw material. The plant is expected to generate more than 3,000,000 kw.-hr. per year.

Coming Electric Vehicle Show in New York.—Arrangements have been made for an electric vehicle show in New York City from April 19 to April 24 at the New York Edison Company's showroom, 15 Irving Place. A parade and a joint lunch with the New York Electrical League will be held.

Pacific Gas & Electric Refuses Standby Service to Modesto and Turlock.—Standby power service will not be furnished by the Pacific Gas & Electric Company to the Modesto and Turlock irrigation districts in California, where energy is being generated by the irrigation officials and sold to the public. In an interview printed in the Modesto *Herald* Frank A. Leach, Jr., vice-president and general manager of the San Francisco company, takes the ground that that company, having done much to build up the city of Modesto and Stanislaus County, cannot consent to put its facilities at the service of a competitor.

Pendleton-Pasco Connection of Oregon Company.—The Pacific Power & Light Company's new 66,000-volt transmission line from Pasco to Pendleton, Ore., which is costing $300,000, will be completed about March 1, after which the present 25,000-volt line from the Walla Walla River will no longer be used except in case of emergency. A new outdoor substation is being built in Pendleton, where the energy will be stepped down to 2,300 volts. In bringing the line from Pasco it was found necessary to build two towers 150 ft. in height where the line crosses the Columbia River. Here the spans are 1,800 ft. long.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations is published in the first issue of each volume. See January 5 issue, page 72, for latest list.]

American Electric Railway Association—Midyear meeting, Chase Hotel, St. Louis, March 4-5. J. W. Welsh, 8 West 40th St., New York.

Oklahoma Utilities Association—Huckins Hotel, Oklahoma City, March 11-13. E. F. McKay, First National Bank Bldg., Oklahoma City.

Association of Electragists, Eastern Division—McAlpin Hotel, New York, March 18.

Illinois State Electric Association—Hotel Sherman, Springfield, Ill., March 26-27. R. V. Prather, Springfield, Ill.

American Institute of Electrical Engineers—Spring convention, Birmingham, Ala., April 7-11. F. L. Hutchinson, 33 West 39th St., New York.

Middle West Division, N. E. L. A.—Kansas City, Mo., April 10-11.

Missouri Association of Public Utilities—Kansas City, April 10-12. F. D. Beardslee, 315 North 12th St., St. Louis.

Wisconsin Utilities Association—Hotel Pfister, Milwaukee, April 17-18. John N. Cadby, 445 Washington Bldg., Madison.

Southwestern Division, N. E. L. A.—New Orleans, April 22-25. S. J. Ballinger, San Antonio, Tex.

Southwestern Public Service Association—New Orleans, April 22-25. E. N. Willis, Dallas, Tex.

American Electrochemical Society—Hotel Bellevue-Stratford, Philadelphia, April 24-26. C. G. Fink, Columbia University, New York.

Wyoming Utilities Association—Cheyenne, May 5-6. H. C. Chappell, Casper, Wyo.

Nebraska Section, N. E. L. A.—Omaha, May 8-9. H. M. Davis, Bankers' Life Bldg., Lincoln.

National Electric Light Association—Atlantic City, N. J., May 19-23. M. H. Aylesworth, 29 West 39th St., New York.

Electric Power Club—Seaview Golf Club, Absecon, N. J., May 26-29.

Iowa Towns Combine to Deal with Central-Station Company.—An association of Iowa town officials, to include Alton, Sioux Center, Rock Valley, Remsen, Marcus, Kingsley, Meriden and Cleghorn, is being formed to deal jointly with the Iowa Light, Heat & Power Company in the matter of rates and other matters pertaining to electric service. The company is expected to meet the towns' committee half way, and a harmonious adjustment of service questions in the eight towns concerned, which are all served by the company's lines, is expected.

San Francisco Men Plan to Develop Hydro Plant in Western Mexico.—San Francisco capital is interested in a hydro-electric project in western Mexico, which is said to be capable of developing more than 150,000 hp. and may mark a new era in the development of that section of the Southern republic. The Sierra Madre Power Company has been incorporated in Mexico to carry out the plan, which includes damming the Rio Verde, in the State of Sinaloa. The dam will be 230 ft. high and will create a reservoir approximately 7 miles long and 2 miles wide at its widest part. At a point 1,700 ft. below the dam the power plant will be constructed with an initial capacity of 15,000 hp. The cities of Mazatlan and Cullacan and the numerous mines in the district are relied on to furnish a market.

Hoover Backs Canada's Request on St. Lawrence Project.—The Canadian government's suggestion that the United States appoint experts to work jointly with similar appointees to be designated by Ottawa on the St. Lawrence-Great Lakes waterways project has been favorably viewed by Secretary Hoover, he says in a communication to Secretary Hughes. Mr. Hoover's opinion was sought by the State Department and will be used as a partial basis for the reply it will make at an early date to the Canadian note on the subject. All of the executive departments asked by Mr. Hughes to give him their observations regarding the appointment of American experts have not yet reported, however, and no answer will be made to the Ottawa communication until these have been received and studied by the State Department officials.

Michigan Rules for Construction of Electrical Lines.—The Michigan Public Utilities Commission has just issued, as Order No. 1868, a pamphlet containing its rules governing the filing of notices and issuing of permits for the construction of electrical lines, which become effective March 1 next. These rules apply to the location, construction, reconstruction and changes in operating conditions of electrical supply and communication lines in overhead and underground construction, whether operated in connection with public utilities privately or municipally owned, with industrial establishments or otherwise. Railroad crossings under standard and emergency permits are treated at length with dimensional drawings and data sheets.

Hydro-Electric Interconnection in Minnesota.—The Minnesota Power & Light Company, with headquarters at Duluth, has taken another step in carrying out its program of interconnecting the scattered hydro-electric power installations of northern Minnesota by acquiring the plant of the Cuyuna Range Power Company at Brainerd. The transfer included power and transmission lines leading to other Cuyuna Iron Range towns and mines, together with water-power sites at Pillager and Crow Wing River near Brainerd. It is a 33,000-volt transmission system, and it is also connected with the Little Falls Water Power Company's system by a 3,000-volt line. An extensive development program will be carried out at once by the Minnesota Power & Light Company in the territory tributary to the system just acquired, and a connection will be made with the present system of the purchasing company by tapping at Riverton the 110,000-volt transmission line now being constructed from Nashwauk to the hydro-electric plant of the Little Falls Water Power Company and the 27,000-hp. plant being built at Blanchard Rapids on the Mississippi River.

Southern California Edison Company to Purchase Power.—The Southern California Edison Company and the San Joaquin Light & Power Corporation have asked the Railroad Commission of California for permission to enter into a partly retroactive agreement to settle the price at which the Edison company will pay for power purchased or to be purchased from the San Joaquin company during the period from November 25, 1923, to July 31, 1924. The agreement provides for a fixed charge of $2.40 per kilowatt of maximum monthly demand, based on the highest consecutive fifteen minutes' demand, and a further charge of 3.9 mills per kilowatt-hour for energy delivered. The maximum monthly fixed charge to be paid in those months in which such a charge shall be created shall be $30,000 and the minimum charge shall be $12,000. It is agreed that the maximum power furnished shall not exceed 20,000 kw. and that the minimum demand shall exceed 12,500 kw.

Sunbury, Pa., Hopes to Be Site of Great Central Station.—A recent option taken on a 48-acre farm site on the Susquehanna River above Hummel's Wharf, near Sunbury, Pa., has given rise to local reports that a great base-load steam-electric generating plant will be built there as a part of the Atlantic Coast superpower system. There are, it is contended, three steam-electric power station sites in the anthracite region of Pennsylvania—one near Pittston, one near the mouth of Nescopeck Creek and one near Sunbury, all on the Susquehanna River—at each of which sufficient condensing water is available to permit the development of about 300,000 kw., and the further contention is made that power generated in or near Sunbury can be delivered in Philadelphia more cheaply than it can be generated in or around the Philadelphia district.

Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men
Engaged in all Branches of the Electrical Industry

H. C. Blackwell in Cincinnati

H. C. Blackwell, who was recently elected vice-president of the Union Gas & Electric Company, Cincinnati, in charge of operations, as was announced in the January 26 issue of the ELECTRICAL WORLD, has arrived in that city and entered upon his new duties there. Mr. Blackwell is nationally known in the electrical industry both as an executive of electric light and power companies and as an active member of the industry's representative associations. Though a native of Canada, he spent his early life in Cincinnati, where he attended the grade

H. C. BLACKWELL

schools and later the old Cincinnati Technical School. After being graduated from Purdue University in 1902 he became associated with J. G. White & Company and various utility corporations as a construction engineer. He built the interurban line from Alton, Ill., to East St. Louis and constructed a number of Illinois street railways and power houses. After serving as vice-president and general manager of the Tri-City Railway & Light Company, Davenport, Iowa, he became affiliated in 1917 with the Kansas City Power & Light Company as vice-president and general manager, having charge of construction and operations. It was from this office that Mr. Blackwell retired to return to Cincinnati. On the evening of January 26 three hundred and fifty employees of the Kansas City Power & Light Company gave a farewell dinner in his honor, and on the following Monday evening some hundred of his business associates gathered at a dinner party to pay him a farewell tribute.

Howard C. Miller, formerly electrical engineer with the Eastern Oregon Light & Power Company, Baker, Ore., is now engaged in power-plant maintenance work with the Washington Pulp & Paper Company, Port Angeles, Wash.

William Irvin Whitfield of Danville, Va., has been made superintendent of the Roanoke Railway & Electric Company, succeeding in that office Graham Claytor.

C. V. Sorenson, who recently resigned as division manager of the Wisconsin-Minnesota Light & Power Company's properties at Rice Lake, has been made general manager of the Attica Electric & Power Company's properties at Attica, Ind. The company is leasing its electric system to the city under a municipal operation and distribution plan.

J. B. Archer, formerly superintendent of the Maryville (Mo.) Electric Light & Power Company, has been made manager of the Shenandoah district of the Iowa Service Company, with headquarters at Shenandoah. Mr. Archer had been with the Maryville company six years.

W. R. Matthews has been appointed illuminating engineer of the Washington Water Power Company, Spokane, Wash.

Ross B. McElroy has been appointed assistant sales manager of the Washington Water Power Company, Spokane, Wash. Since 1922 Mr. McElroy has been in charge of the company's electric store.

C. S. Reynolds, insurance and real estate agent for the Puget Sound Power & Light Company, has been made publicity manager at the company's Tacoma office. Mr. Reynolds is succeeding C. V. Allen, recently transferred to Seattle.

C. V. Allen, publicity manager and representative of the securities department of the Puget Sound Power & Light Company in Tacoma, Wash., has been transferred to the company's Seattle office, where he will be associated with N. W. Brockett in public relations work. Mr. Allen has been identified with the Puget Sound company since 1911, when he entered its service as land and tax agent.

Willard F. Graves has been appointed chief engineer of the Terre Haute, Indianapolis & Eastern Traction Company, with headquarters at Indianapolis. Mr. Graves was formerly associated for nine years with the Montreal Tramways as chief engineer.

G. H. Ahlborn, formerly connected with the Studebaker Corporation at South Bend, Ind., in the organization of electrical, piping and power departments for a new plant in that city, has recently entered the sales department of the Kansas Gas & Electric Company, Wichita, Kan. Mr. Ahlborn previously engaged in sales work for the Allis-Chalmers Manufacturing Company, where his duties also included the

assembling and testing of heavy electric machinery. Before identifying himself with the Studebaker Corporation he spent four years with the Bureau of Standards in electrical engineering work and four years on the operation and supervision of all construction on a light, power and street-railway property at Zanesville, Ohio.

A. E. Bettis and E. Jowett New Vice-Presidents at Kansas City

Alex E. Bettis, district superintendent of the Kansas City Power & Light Company, Kansas City, Mo., and Edwin Jowett, superintendent of production, were among the five department heads of the company advanced to vice-presidents in their respective departments at a recent meeting of the board of directors. Mr. Bettis, who has been associated with the Kansas City company since 1904, will be in charge of operation, lighting and heating. During the period he has been associated with the company he has served as chief civil and mechanical engineer, chief engineer and superintendent of engineering and construction, which carried with it authority over the construction, maintenance, operating, trouble and various departments of a similar kind.

Mr. Jowett became identified with the Kansas City company in 1918, when he was appointed superintendent of power plants, after resigning his position as chief operating engineer of the Texas Power & Light Company, the Fort Worth Power & Light Company and the Dallas Power & Light Company. Before affiliating himself with the Texas companies Mr. Jowett had been for many years assistant chief engineer of the Fish and Quarry Street stations of the Commonwealth Edison Company, Chicago.

The other new executives include Chester C. Smith, in charge of contracts and accounts; Fred S. Dewey, in charge of stores and power and light sales, and Charles F. Farley, in charge of the electric shop, meter reading and collections. J. F. Porter, Jr., will be assistant to President Joseph F. Porter. No new general manager will be elected to succeed H. C. Blackwell, who recently left for Cincinnati.

Martin Juhl, for many years district superintendent of the Lake Superior District Power Company's electric, gas, city and interurban electric railway properties in Ashland, has been selected to take charge of the electric distribution plant of the Washburn (Wis.) Electric Light & Power Company, the properties of which the Lake Superior District Power Company recently took over. Mr. Juhl will succeed Frank W. Downs, who has been in charge of the plant and local business under the old management.

L. M. Nichols has been appointed assistant to the general merchandise manager of the General Electric Company, and **J. O. Wetherbie** has been made field supervisor of that department, according to a recent announcement by G. P. Baldwin, general merchandise manager of the General Electric Company.

T. T. Parker Made Vice-President of Dubuque Company

T. T. Parker, general manager of the Dubuque (Iowa) Electric Company, has recently been made vice-president and general manager of the company. After a four-year course at the Kansas State Agricultural College at Manhattan, which he completed in 1907, Mr. Parker engaged in electrical distribution work for a time and subsequently became identified with the Kansas Electric Utilities Company at Parsons, where he remained for two years as power salesman and commercial manager. Later he entered the service of the

T. T. PARKER

Union City (Ind.) Electric Company as manager but severed his connection with the company after three years' association to become general manager of the Kansas Electric Power Company at Emporia, Kan.

Samuel Ferguson has been elected president of the Hartford (Conn.) Electric Light Company, succeeding S. G. Dunham, who has resigned after twelve years' service. Mr. Ferguson is one of the outstanding figures of the central-station industry and is president of the New England Division of the National Electric Light Association. He has been vice-president of the Hartford company for the past eleven years. A biographical sketch of Mr. Ferguson was published in the ELECTRICAL WORLD for January 28, 1922, with comment upon the contributions to the electrical industry that have been the outcome of his unusual economic and engineering abilities.

Frank R. Coates, president of the Toledo Edison Company and a director of the Cities Service Company, New York, which controls the Toledo company, has left on an inspection trip through the South, where he will visit utility properties operated by the company in Durham, N. C., and in Athens and Macon, Ga.

Evan E. Rowe, formerly associated with the Missouri Public Utilities Company, St. Louis, is now connected with the Oskaloosa (Iowa) Traction & Light Company in the capacity of electrical engineer.

Frank H. Klippel, formerly identified with the Pittsburg (Cal.) office of the Great Western Power Company, has been transferred to Sacramento in the capacity of superintendent.

T. H. King has been made representative of the securities department of the Puget Sound Power & Light Company in Tacoma, succeeding C. V. Allen, recently transferred to Seattle.

Donald Parker has been appointed manager for the Alabama Power Company at Union Springs, Ala., following previous experience in the line and new-business departments at Montgomery and in reconstruction work near the latter point.

R. E. Jerauld, formerly connected with the Salt Lake City office of the General Electric Company, has been made district manager of the office of the company at Phoenix, Ariz. The Phoenix office is now in the Los Angeles territory instead of under the El Paso office as in the past.

J. R. Colville, formerly in the engineering department of the National Lamp Works of the General Electric Company, Nela Park, Cleveland, has taken up sales and commercial work under L. P. Sawyer, chairman of the sales divisions of the National Lamp Works.

Obituary

E. C. Boquet, for the past fifteen years manager of the Southern California Edison Company's offices in the Santa Monica Bay district, recently dropped dead. Mr. Boquet had been connected with the Southern California Edison Company since his seventeenth year.

Frank E. Kinsman, electrical inventor, died on February 5 at his home in Leominster, Mass., following a general breakdown. Born in Leominster seventy-one years ago, Mr. Kinsman became prominent in the electrical industry at an early age and for many years was associated with both the late Alexander G. Bell and Thomas A. Edison. He introduced commercially the arc lamp on low-tension incandescent circuits and as early as 1877 had established a central telephone business in Chicago. In 1907 Mr. Kinsman established the Kinsman Block System Company, which owns his patents for automatically controlling the motive power and brakes on trains. In later years he was consulting engineer for several large electrical concerns.

B. L. Knowles, manager of the publicity department of the Worthington Pump & Machinery Corporation, died February 14, as a result of a cerebral hemorrhage. Mr. Knowles was forty-five years old at the time of his death and had spent twenty-eight years with the Worthington corporation.

Siegfried Heller, president and treasurer of the S. Heller Elevator Company, manufacturer of electric, hydraulic, belt and hand-power elevators for passenger and freight service, died February 9, at his home in Milwaukee, after a short illness. Mr. Heller organized the company which bears his name in 1895 and since that time has remained at its head as president.

Recent Court Decisions

Contributory Negligence of Electrician Injured by Bulbs Exploding Under Overcharge a Question for Jury.—In Hesser vs. City of Carthage the Springfield (Mo.) Court of Appeals held that where city workmen connected a wire carrying 2,300 volts to one carrying 110 volts, causing bulbs in a residence district to explode, the question whether an experienced electrician injured while repairing those in one house, a few moments after inspecting those in another and finding no indication of overcharging, was contributorily negligent was for the jury to decide. (256 S. W. 161.)*

Commission May Inspect Books of Public Utility Even Though No Proceeding Is Pending.—The Supreme Court of Kansas, in State ex rel. Public Utilities Commission vs. Atchison, Topeka & Santa Fé Railway, held that under the state laws an inspection of the books and papers of a public utility organized under the laws of Kansas and operating within the state may be made by the Public Utilities Commission or its agents, although there may be no complaint on file with the commission or proceeding pending before it which requires such inspection or examination. (221 Pac. 259.)

Limitations of Commission's Powers.—The Public Service Commission of Missouri, in conducting its hearings, does not, according to the Supreme Court of that state, sit as a legislative committee for the purpose of formulating a public policy and putting it into effect by the issuance of general rules legislative in nature, but is limited to an investigation of specific acts of omission and commission on the part of utilities complained against. The court for this reason denied a mandamus sought by the commission against the St. Louis-San Francisco Railway Company. (256 S. W. 226.)

Scope of Employee's Duties as It Relates to the Incurrence of Risk.—In a suit (Lofty vs. Lynch-McDonald Construction Company) brought to recover damages for a death caused by electricity the Kansas City Court of Appeals found the company liable while acquitting the city of Moberly, a co-defendant. The construction company, in executing a contract with the city, had strung a high-tension uninsulated wire three or four feet above the roof of a shed, and a city employee in attempting to remove a defective iron drain pipe from this roof was killed by the pipe coming into contact with the wire. The court held that the man could not as a matter of law be said to be outside the line of his duty, as the pipe dripped on the floor of a room where he operated an electric pump, thereby detracting from his safety; but even if the employee had been acting outside the line of his duty, this would not constitute a defense against the contractor's negligence in stringing the wire as it did. (256 S. W. 83.)

Award of $7,500 to Five-Year-Old Child for Injury Disabling Hand Not Excessive.—Pointing out that a five-year-old child could not be held guilty of contributory negligence for touching a live electric wire, broken and lying on the sidewalk, the Supreme Court of Errors of Connecticut sustained as not excessive a verdict of $7,500 damages in Rutkowski vs. Connecticut Light & Power Company. The evidence showed that the child's hand had been permanently disfigured and disabled by contact under the circumstances just stated with a wire belonging to the company, and that the defendant company knew the wire had rubbed against a tree and worn off the insulation. Evidence that at the time of the accident the wind was blowing 25 miles an hour did not make the lower court commit an error in denying motions to set aside the verdict as against the evidence. (123 At. 25.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Not Always Advisable to Discard Old Equipment for More Efficient Type.—In fixing the value of the property of the Idaho Power Company for rate-making purposes at $15,456,106, exclusive of working capital, the Idaho Public Utilities Commission said that the property was in 100 per cent condition and rendering efficient service. The commission observed: "We wish to point out that the former finding of value was based on the full service value of the items then used in the public service. It is not reasonable to suppose that any plant item producing full service value on its cost is incapable of further improvement, nor is it proper to reason that the additional investment to this item will not further improve its service value to the extent of the cost of the improvement. It is not necessary that production of additional units of service result from additional investment. A reasonable investment may be made to lessen the cost of producing or delivering the same number of units, to make their production and delivery more safe to the company's workmen and to the public, or to make the continuity of service more certain. However, the commission is of the opinion that, in view of the financial situation existing in the territory served by the power company during the past three and one-half years, although requests and demands may have come from community officials and groups of individuals for more efficient service and a much more expensive type of installation, yet it was incumbent upon the management of the Idaho Power Company to use due discretion in the expenditure of additional capital in its field, at all times taking into account the ability of its patrons to meet the additional demands for higher type of equipment. It is well to have the very latest improved type of equipment in electrical as well as other service, but where a utility is equipped to furnish reasonably satisfactory service it cannot be considered good policy to expend additional money simply because some recently developed type of equipment might be installed, unless such installation produces an equivalent in additional output of electrical energy for consumption and a more efficient service or reduces expense for maintenance and operation."

Municipal Competition with Established Company Forbidden by Maryland Commission.—In denying the application of the city of Hagerstown for authority to build, maintain and operate for other than municipal purposes an electric plant and to issue $300,000 in bonds for this purpose, the Public Service Commission of Maryland said that it would be "loath to interpose any obstacle in the way of the fulfillment of the city's will were not the purpose of Hagerstown violative of the very cardinal principle of commission regulation, inconsistent with the aims of state-wide utility control and destructive of the plans for the extension of electric service at cheap rates throughout western Maryland. Were the petitioner a public service corporation only and conditions in the electric light and power field in and around Hagerstown such as our investigation discloses, we would promptly and positively prohibit the project by withholding our certificate. This would not be the arbitrary exercise of a discretionary power, but on the contrary the adherence to a settled policy." The commission points to the admission that the city has in operation a plant adequate for its own needs and that the desire of the municipal authorities is to compete with the Potomac Public Service Company in neighboring communities. It says that some citizens "express a righteous indignation because they believe that this state commission is thwarting the city's will in a purely municipal matter, losing sight of the fact that Hagerstown is attempting to secure approval of a bond issue to be used for a plant, not to light its streets with the incidental privilege of selling the excess to private consumers, for this they now have and may continue to possess, but are seeking the commission's authority to engage in the private and in no sense local governmental undertaking of general electric service in competition with an established public service company capable of producing energy at less cost, for greater demands and with more certainty of continuous service than can possibly be expected from the municipal plant now designed or of future contemplation." The commission added: "It is also our belief that the approval and execution of the plan would result in the elimination and wiping out of a large part of that asset regarded as the capitalization earnings of the municipal plant, to save and preserve which some votes for ratification probably were cast."

Manufacturing and Markets

Devoted to the Discussion of Business and Economic Problems of the Producer and Distributor, with Market Reports, Trade Activities, Foreign and Construction News

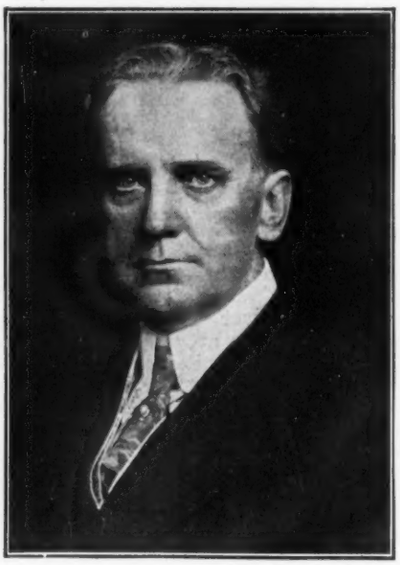
Foreign Customers Need America's Help

General Tripp Dwells on the Opportunities for Electrical Trade in the Orient and How They Should Be Met—Japan's Predominance and Progressive Spirit

AMERICAN manufacturers must be prepared to help in the financing of foreign power developments and to co-operate in the expanding of electric service, if we are to develop our foreign trade on an extensive scale. This opinion was firmly expressed by General Guy E. Tripp, chairman of the board of the Westinghouse Electric & Manufacturing Company, who has just returned from a trip around the world, in which he visted Japan, the Philippines, China, India and Europe. It was during his stay in Japan that General Tripp consummated the arrangements whereby the Westinghouse Electric & Manufacturing Company together with the Westinghouse International Company joined in co-operative agreements with the Mitsubishi interests and Takata & Company to bring about more rapid developments in electrical manufacture in Japan.

The Japanese people, General Tripp said, are re-establishing themselves from an electrical standpoint very rapidly. Only one of the large power properties was seriously damaged by the earthquake, although the destruction of transmission and distribution lines was considerable in the devastated district. A very large volume of installation work will be required in the rebuilding of Tokyo, Yokohama and other communities within the zone of destruction. The great bulk of Japanese activity in the electrical field, however, is concerned with the expansion of the superpower system, which is rapidly being extended through the building of new hydro-electric stations and the interconnection of existing plants.

A very large portion of this business will undoubtedly come to America, General Tripp asserted. Indeed, American electrical manufacturers can count on a large share of the Japanese market for many years to come. True, the Japanese are gradually developing the manufacture of electrical products themselves, and the trend is undoubtedly toward an increased activity in this field. Large results will require a number of years, however. During this period American exports will gradually decrease Small motors,



GEN. GUY E. TRIPP

small wiring devices, appliances and similar lines will naturally be the principal field of Japanese activity for the present. The best market for American manufactures will be in the field of large apparatus and equipment, but it is highly improbable that Japan will ever fully satisfy its own market, and the American manufacturer can, therefore, count on a sustained demand for his goods if they are properly established. The most assured basis will be through permanent affiliations between American and Japanese manufacturers who will co-operatively develop and sustain markets for standard lines. Meanwhile Japan is buying as intelligently as we would do in this country, selecting materials for quality and maintaining a high standard of construction that assures permanence of investment. The type of hydro-electric development now being installed compares favorably with the best practice in this country.

Interesting developments in the radio field will probably be seen before a great while in Japan. At present there is no broadcasting whatever, and a strong sentiment is forming in favor of the expansion of this service either under government control or on some other basis. With the institution of broadcasting there should be a large development in the market for radio materials.

"In the Far East," said General Tripp, "Japan is an outstanding figure. She alone of all the Oriental nations needs no extensive help from Europe and America. Though the destruction caused by the earthquake was enormous, it was not an unmixed evil. The destroyed cities will be rebuilt on a very much better scale and the buildings will be as nearly proof against earthquakes as it is possible to make them. The Japanese are doing the reconstruction work themselves, and the technical and financial experience thus gained will undoubtedly be worth the price to this progressive and energetic nation.

"In the Philippines, China, India and other Asiatic countries there are prospects for extensive industrial developments, but, generally speaking, they will be made by Europeans, Americans and Japanese. There is, apparently, no racial desire for improvements and progress as we understand these words. China is a conspicuous example of the Oriental tendency to resist Occidental ideas."

The American business man must not be deceived by the idea that Asia is industrially comparable with Europe or America, General Tripp said. China, for instance, is progressing electrically only in the treaty ports, and Great Britain continues to wield the strongest influence over her markets for the reason that British trade has long been well established and

has built up local traditions which have won the attention and the confidence of the native dealers.

General Tripp devoted most of his time to the Far East and made no extended investigation of conditions in Europe. He reports that the export business of the Westinghouse company has very materially increased during the last year under new organization plans. The outlook for increased export sales is promising. He stressed, however, the importance of recognition on the part of American manufacturers that they owe a responsibility to their foreign customers to extend practical co-operation, assisting them in the generation and utilization of electrical power, both through aid in financing their projects and through guidance in their commercial developments.

The Problem of Consigned Stocks

A Practice Introduced By Manufacturers Who Desired Greater Distribution Which Has Proved Detrimental to Both the Jobber and the Manufacturer

BY J. C. SCHMIDTBAUER
Vice-president Julius Andrae & Sons, Milwaukee

SEVERAL years ago, in an attempt to gain an advantage over competitors, certain manufacturers hit upon the idea of helping jobbers financially by consigning stock to them rather than selling it outright. By this practice manufacturers retained a hold on merchandise delivered to the jobbers up to the time the goods were actually sold and obtained representation in certain localities where it had been impossible for them to make sales. While not disposed to make any concession in price, these manufacturers reasoned that by making a concession in the terms on which their merchandise was ordinarily sold they would obtain the support of the distributors to whom they consigned merchandise, and at the expense of their competitors. This plan quite naturally appealed to the distributor on the assumption that he in turn would have a decided advantage over his competitors inasmuch as he was not obliged to make any investment and was also protected against any decline in the price of his merchandise.

STOCK DUPLICATION

In the beginning the consignment of stock to jobbers worked out very beneficially to the few manufacturers and jobbers who had adopted this practice. The fundamental reasoning behind this plan was correct up to the time that competitive manufacturers adopted a similar plan whereby they not only extended this concession to their distributors but sometimes also actually financed the business of these distributors. This plan then was also extended to anybody and everybody who was disposed to enter the electrical supply jobbing business, with the result that there was built up a large and unnecessary duplication of merchandise. On the theory that it was possible to make a profit on the sale of such merchandise, even when sold at a less profit than is ordinarily required to operate a jobbing establishment, price cutting was indulged in on these lines. Unfortunately for those concerned, this price cutting gradually extended to such lines as were purchased outright, with the result that electrical supply jobbing has arrived at a stage where it is largely overdone, and it is yearly growing more unprofitable for the leading jobbing houses, which already had carried the burden of the early pioneering expenses.

So today the electrical jobbing industry faces a situation which is a direct outgrowth of these frantic attempts of manufacturers to attain greater distribution. And to what success? By supplying goods on consignment to jobbers with limited capital manufacturers have established duplicate stocks in many localities to the detriment of the jobber who carries his own investment. Since these consigned stocks are practically the equivalent of manufacturers' branch warehouses, the jobber so favored has practically no capital invested in warehouse stocks and can, accordingly, sell at a much lower cost, and any neighboring legitimate jobber who is carrying his own overhead is placed at the disadvantage of having to sell at a smaller profit. The duplication of stocks on the shelves of manufacturers' branch warehouses and those of the local jobber is economically unjustified even if a greater market development is desired. Moreover, by such a duplication the jobber's ability to attract capital is greatly lowered, because he is not allowed to serve as an economic distributor of goods and afforded a sufficient return to warrant expansion. Thus, as more more and more jobbers enter the field under such conditions, the situation becomes pyramided and their earnings are lowered in spite of higher cost to the public.

If the practice of consigning merchandise is to be extended further, it naturally follows that it will have a tendency to create additional jobbers, and this will automatically force properly financed institutions out of business as there will be no incentive for them to reinvest their capital in a business of such a character. Were it necessary to invest any considerable amount of money in the electrical supply jobbing business, it would naturally follow that concerns properly financed could afford to carry the volume of merchandise necessary to render this economic service without consigned stocks, and there would then be some incentive for capital to interest itself in the business. Unless the demand for electrical products is developed faster than the number of jobbers created each year, it will be merely a case of the survival of the fittest. Evidence of this may be had from the mortuary figures among electrical dealers during the past five years.

LOSS TO MANUFACTURERS

It may be difficult to convert the manufacturers now supplying goods on a consignment basis to a system involving the outright buying of stock by jobbers, but there is no denying the fact that it costs the manufacturer a considerable amount of money to carry duplicate stocks in as many parts of the country. Therefore it is my belief that sooner or later some manufacturer will take advantage of this condition by refusing consignments and making his prices lower than is now possible for a manufacturer who does carry this consignment investment. In that manner the plan will ultimately be destroyed.

By allowing the jobber to function in the only way which is economically justified—by buying stocks outright and aggressively seeking the market for them—manufacturers would reduce their own distribution expenses materially and undoubtedly would get greater sales service from the jobbers. Furthermore, the jobbers who conducted their business on such a businesslike basis would have a better chance for existence than is

now possible under the present scheme of consignment. For there is now no real incentive for capital to interest itself in the electrical supply business either at wholesale or retail, inasmuch as it is virtually impossible to derive a fair profit under existing conditions. This problem of consigned stocks is one vitally affecting the entire jobbing field and every manufacturer who sells jobbing lines, and it should merit further effort in the determination of some practical solution.

Business Conditions

A Survey of Important Developments in the Electrical Market Including Data on Production, the Sales Outlook, Credits, Exports, the Metals and Other Conditions Affecting Cost, Supply and Demand

THE strongest single element in the electrical market this week is central-station purchasing. Except for the single large storm in the Middle West, open weather has continued and sales to power companies throughout the country have hardly slackened in the entire season. Wholesale business is quieter this month than last, which was expected, and industrial buying is rather slow, but electrical jobbers made more money in the month of January than for some time past and are well satisfied with the situation. In short, business in the electrical industry is normal and healthy, with central-station buying a stabilizing influence.

In New England the lack of salespeople is reported to be handicapping the electrical trade, but there is a satisfactory volume of business, stocks are accumulating, prices are firm and financial conditions are generally strong. In the New York district central-station purchasing continues strong with plenty of active negotiations under way, the bulk of material purchased being for the utilization of power. Electric truck sales and refrigerating equipment are a feature in the market at present in the Southeast, and intensive range campaigns are being planned at many points for the early spring. A very good business continues in the Middle West, with noticeably large orders recorded for poles and reflectors, and also a strong demand from central stations for power-utilization equipment. The Pacific Coast reports that power company business continues active but retail trade is slow.

High-Tension Equipment Sales Show Good Increase

TWO manufacturers of high-tension equipment report an increase in business of 100 per cent during 1923 over 1922, while two others announce increases from 35 to 60 per cent. At the present time deliveries are much better than they were during the fall, because of the improved porcelain shipments from the insulator manufacturers. Standard high-tension equipment in stock is shipped immediately, while other catalog material usually requires from one to five weeks, depending upon the style of equipment, with special equipment requiring about three months. Manufacturers do not anticipate any price changes, although they are watching the cost of raw materials closely. Unless future copper and porcelain prices increase very much, high-tension equipment prices will remain as they are.

Stocks are now in better shape than existed during any time last year, but the delivery problem of insulators is still in a critical stage. While the present seasonal variation in porcelain sales is permitting high-tension manufacturers to improve their insulator stocks, they feel that when insulator buying increases in the spring porcelain deliveries will again be delayed as in 1923. However, every effort is being made to meet this increasing demand by the installation of new kilns.

The distribution of high-tension equipment is still fairly uniform over the United States. Electrical development in Australia and New Zealand is progressing very rapidly, according to one manufacturer, who recently received an order for 110,000-volt lightning arresters and air-break switches from these countries.

European Conditions in the Transmission Field

ADVERSE exchange conditions are laying a very serious handicap upon American manufacturers in almost every European country except Spain, and in the opinion of H. W. Young, president of the Delta-Star Electric Company, Chicago, little business can be done while this situation prevails. Spain, however, does offer a considerable opportunity to American exporters. Mr. Young has just returned from an extended trip abroad and has made a careful study of conditions surrounding high-tension transmission on the European continent. Switzerland, he says, is unable to sell any materials to the surrounding countries, as Swiss exchange is about on a par with ours, but France and Germany are in a much better position in this respect.

European methods of manufacture in the field of transmission equipment impressed Mr. Young as antiquated and affording very limited facilities for production. There appears to be no standardization, so that much hand work is being done, and whenever a production order is received the tendency is to increase prices, which is the reverse of conditions here. A great deal of jealousy exists in the industry also, so that if a manufacturer requires a small amount of special apparatus that is made by a competitor he makes it himself at a cost greater than that for which he could purchase it. For instance, if fifteen small motors were required for use in connection with other apparatus, probably, instead of purchasing these motors cheaply in the market, the manufacturer would design and build them at considerably greater expense, rather than let it be known that such motors were required.

So far as cable manufacture is concerned, Mr. Young feels that Europe is ahead of America. He also noted that there is a tendency toward better insulation for transmission lines instead of using too many protective devices. He does not believe that transmission voltages higher than 110 kv. will be adopted in Europe owing to geographical conditions and the concentration of population.

Delinquent Electrical Accounts Lower in January

FOUR of the five territorial divisions reporting to the National Electric Credit Association listed a lower number of delinquent accounts for January, 1924, than in the preceding month. But the average amount for the same period increased in three territories—the Central Division, New York and New England. In the Central Division the total amount for January, 1924, was $104,657 as against $88,812 for January, 1923. This increased the average amount during the period from $110 to $163. In the New England, New York and Philadelphia territories the number of delinquent accounts and the total value decreased from December, 1923, to January, 1924. The Pacific Coast is still operating with the lowest number of delinquent accounts, which on January, 1924, stood as nineteen, with an average amount of $99.81.

DELINQUENT ACCOUNTS IN JANUARY

Branch and Month	Number of Delinquent Accounts Reported	Total Amount	Average Amount
Central Division:			
Dec., 1922....	1,104	$128,342.89	$125.84
Dec., 1923....	746	92,731.23	124.30
Jan., 1923....	809	88,811.52	109.78
Jan., 1924....	643	104,657.18	162.76
New York:			
Dec., 1922....	485	93,428.00	193.00
Dec., 1923....	344	42,943.00	125.00
Jan., 1923....	392	54,452.00	139.00
Jan., 1924....	248	40,799.00	164.00
Philadelphia:			
Dec., 1922....	183	19,307.58	105.51
Dec., 1923....	208	28,025.04	134.74
Jan., 1923....	216	32,449.17	150.23
Jan., 1924....	197	22,760.53	115.54
New England:			
Dec., 1922....	34	3,809.68	112.05
Dec., 1923....	36	4,176.85	116.02
Jan., 1923....	66	7,805.66	118.27
Jan., 1924....	28	3,948.95	141.03
Pacific Coast:			
Dec., 1922....	14	2,225.43	158.90
Dec., 1923....	17	1,791.96	105.40
Jan., 1923....	12	1,087.20	90.60
Jan., 1924....	19	1,896.43	99.81

Electric Truck Sales Gaining in Southeast

DURING the past year electric truck manufacturers' representatives in the Southeast have done considerable missionary work, establishing a number of dealer connections, and they have reported a satisfactory increase in volume of sales. The past year's work should begin to bear fruit with the opening of spring, and it is estimated that sales this year will show about a 20 per cent increase over 1923. Prior to 1923 the Southeast was prac-

tically virgin territory as far as electric trucks were concerned.

Electrical refrigerating equipment is gaining in popularity, owing to active educational work, and good sales are reported. One manufacturer during the past few months has introduced electrical refrigerating equipment for use in connection with farm-lighting outfits, and, judging from the number of orders to date and the continued excellent sales of lighting plants, this specialty will be in great demand in the rural sections.

An electrical ice cream cabinet that is having a good sale to drugstores and soda fountains is also being exploited. Many orders have been received for this equipment with deliveries from four to six weeks. Electric range sales show an encouraging increase over the same period of last year, with the volume gaining steadily. Range campaigns are planned in practically all the larger central stations in the Southeast during the early spring, and good stocks will be maintained in the territory to meet the resulting demand.

As was to be expected, jobbers report a slowing up in the movement of electrical heating appliances since the holidays, but they say that sales are good for this period of the year. Central stations are placing very satisfactory orders for poles and pole-line hardware.

Central-Station Buying Strong in New York District

CENTRAL-STATION purchasing in the New York district still continues strong, and there is no reason to expect it to slow down. Active negotiations under way at the present time are fully as heavy as last year, and central-station budgets in all cases are in excess of 1923. It is anticipated that the character of the apparatus to be purchased will in the bulk be for the utilization of power; that is, transmission-line material, watt-hour meters, transformers, switching equipment, etc. Next will come major generating equipment. Watt-hour meters and transformers are moving especially well at this time. The installation of new tie lines, new substations and changes in distribution voltages are all calling for new equipment, while one company is gradually eliminating its entire direct-current distribution system. With all these projects under way and with money more freely available to central stations, manufacturers feel that business for central-station apparatus will depend largely on how much they can build. All central-station apparatus prices are in general stabilized and no movements are anticipated.

Railway business is expected to remain normal throughout the year. The result of the Interstate Commerce Commission ruling on automatic signals is somewhat uncertain at present as a committee has been formed by the roads to consider an appeal.

The demand in the general supply and industrial equipment lines is at present good but slow, being normal for this period, with orders equally distributed and deliveries somewhat better on industrial equipment. There is a noticeable improvement in industrial lighting fixtures. A good fan season is expected because of the education of the public in the various uses of this article and the benefits to be derived from it, and it is believed that weather conditions will not affect sales to the same extent as formerly.

The recent increases in the price of copper is naturally being reflected in corresponding increases in copper wire, condenser tubes and other interrelated products.

Power Companies Active on the Pacific Coast

BUSINESS conditions on the Pacific Coast are very good with the exception of a noticeable weakness in retailing in certain country districts. This weakness may be attributed to the drought, current tax collections and the natural reaction from the extremely busy holiday season. Small appliances are moving fairly well, but the larger items are slow.

Power companies are very active, having made some large purchases during the past week, including $40,000 worth of lead cable, principally 400,000 circ.mil, one and three-conductor, and fifteen carloads of fiber conduit. The demand for strain insulators is much better than usual as a straight carload of assorted types is now considered a stock order in place of a few thousand. Pole-line hardware has decreased about 5 per cent, but cross-arm braces have increased by that amount. The demand for this material has increased and is expected to jump further when the spring construction program gets under way. A railroad dealer reports a 300-mile iron telegraph wire order, although other lines are not very active. Comparatively few fan contracts have been turned in so far because of a general apathy, while the radiator season has practically closed with an estimated decrease of about 10 per cent under last season, probably due to the short winter.

Collections for time payments are satisfactory, and other collections are good with the exception of the country districts where business is not up to normal. Stocks are in good shape, and apparently there is little surplus to carry over.

Very Good Business in Middle West with Large Orders

BUSINESS in the Middle West remains much the same this week as last. The demand for most lines of merchandise supplies and equipment has been good. Jobbers and utilities are placing their requirements, and there is an active demand for pole-line hardware. One manufacturer received a single order for poles amounting to more than $100,000. Reflector sales have been noticeably strong, with one order for over $10,000 reported. Conduit sales are good with prices still firm. Code wire business holds up well, although price changes are expected to follow the continued advance in copper. There was an 8 per cent decline in the price of outlet boxes last week, which was followed this week by an additional 10 per cent decline announced by several of the large manufacturers. This additional price decline is not expected to remain in effect long and applies only to the Chicago market, it being directly accredited to a somewhat peculiar competitive condition.

Transformer sales have been good, the demand being greater than the manufacturing facilities in many cases. Meter sales are excellent, and several large orders were received from central stations in the Middle West. Radio demand remains very active, with the supply inadequate, particularly on amplifier tubes, which has suffered a continued shortage.

Demand for Salespeople Exceeds Supply in New England

THE New England electrical trade is at present handicapped by the inability to secure adequate sales personnel. One central station reports that it could use a score of salespeople of the right caliber at once if they were available; others are in the market for both appliance and power salesmen, and there is a real scarcity of higher-grade men.

Electrical supply jobbers report a satisfactory volume of business, with occasional temporary recessions in daily demand. Stocks are accumulating, but prices hold firm in most lines. Table taps weakened slightly on late quotations and storage-battery prices underwent some readjustments. Portable-lamp sales are above expectations, wire and low-tension cable is dull, and deliveries are improving on high-tension cable. Loom and porcelain are quiet, but the outlook is favorable for increased sales of inside construction material, and a good fixture trade is anticipated this spring.

General business is characterized by strong financial conditions, with widespread sentiment on behalf of tax reduction along administration lines. Pending this commitments are hesitant as regards many important projects.

The Metal Market

COPPER demand has been somewhat less active than has been the case in the last week. Although producers are asking 13⅜ cents, purchasers are more reserved. Lead is still scarce with prices higher, and consumers complain that deliveries on contract are unsatisfactory. Galvanizers and brass mills still continue to create a strong demand for zinc, while the fluctuating prices of tin have been attracting a fair amount of buying.

NEW YORK METAL MARKET PRICES

	Feb. 13, 1924 Cents per Pound	Feb. 20, 1924 Cents per Pound
Copper, electrolytic	12⅞	13⅜
Lead, Am. S. & R. price	8.25	8.50
Antimony	10.50	11.00
Nickel, ingot	28	28
Zinc, spot	7.10	7.25
Tin, Straits	54	54.00
Aluminum, 98 to 99 per cent	27	27

Activities of the Trade

Devoted to News of the
Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

Electric Corporation Installs Twenty One-Ton Electric Trucks

The Electric Truck Transportation Corporation, 25 West Forty-third Street, New York, has just completed the installation of a "fleet" of twenty one-ton electric motor trucks for the F. L. Bradbury Company, Long Island City, a company that since 1888 has utilized every form of delivery from the pushcart to the gasoline delivery wagon.

With the installation of electric motor trucks and delivery wagons the Electric Truck Transportation Corporation provides engineering, designing, financing, selection and operation in co-operation with light and power companies desiring to build up the sale of energy during the off-peak period. This purchase financing is by bonds of the corporation offered in combination with its common stock, each $100 of outstanding bonds being protected by 115 per cent of rated high-class public utility bonds deposited with the Equitable Trust Company of New York.

International Combustion Organizes Rotterdam Company

The International Combustion Engineering Corporation has joined Hugo Stinnes in organizing the Carbo Union Company, Rotterdam, for the manufacture and sale of fuel. George E. Learnard, president of the International, states that the formation of the Carbo Union Company completes negotiations which have been going on between his company and Hugo Stinnes for more than a year.

The new company will engage actively in the manufacture and sale of automatic stokers and pulverized-fuel equipment and will do in Germany and central Europe exactly the same kind of business that is being done by the International in this country and that the Vickers & International Combustion Engineering, Ltd., is about to do in the British Empire.

Blaw-Knox Company Makes Changes in Sales Organization

The Blaw-Knox Company, Pittsburgh, announces the following developments in its sales organization:

Robert T. Harris of the New York office has been transferred to Baltimore as district sales manager; Dan W. Healy remains at New York as district sales manager of the standard building department; Walter H. Duncar has joined the sales staff of the road equipment department; William F. Glasser has been promoted to assistant chief engineer of the heavy forms department; Charles K. Wehn of the Chicago office has been transferred to the Pittsburgh office as district manager of the standard steel building department, and R. D. Spradling of the Baltimore office has been made district manager of the standard building department at Chicago.

General Electric Gives Workers Extra Compensation

The General Electric Company announces that supplementary compensation totaling $1,178,595 has just been paid to 27,620 employees scattered throughout the company's many factories and offices in the United States. The payments represent 5 per cent of the earnings for the six months ended December 31, 1923, and were made to employees who have been in the company's service continually for five years or more at that date. Payments were made in bonds of the General Electric Securities Corporation, which yield 8 per cent to employees of the company.

Soderberg Self-Baking Electrode

C. W. Eger, managing director of Electrokemisk Industri, Norway, is now in the United States with his metallurgical adviser, Dr. M. Sem, to negotiate for the use of the Soderberg continuous self-baking electrode. Mr. Eger reports that licenses for the use of the Soderberg electrode and process have been issued to twenty-four large companies and that more than 200,000 kw. of carbide, ferro-alloys, iron-smelting, aluminum, steel and other furnaces are using or installing the Soderberg electrode.

Mr. Eger or Dr. Sem can be reached through their American representatives, the Electric Furnace Construction Company, 1015 Chestnut Street, Philadelphia.

Edward Miller Company Takes Over Ivanhoe-Regent

Announcement is made of the reorganization of Edward Miller & Company of Meriden, Conn., under the name of the Miller Company and its acquisition of the Ivanhoe-Regent Works of General Electric Company. The Ivanhoe-Regent Works becomes the Ivanhoe Division of the Miller Company. No change in policy on the part of the Miller Company or the Ivanhoe Division of the Miller Company is contemplated. W. F. Minor, manager of the Ivanhoe-Regent Works of General Electric Company, continues as manager of the Ivanhoe division of the Miller Company.

Thus are brought together two organizations which have been among the leaders of their respective activities in the lighting industry.

Co-operative Fan-Motor Program

The Fan Motor Section of the Associated Manufacturers of Electrical Supplies, in co-operation with the Society for Electrical Development, has undertaken a co-operative fan-motor promotional program designed to emphasize the diversified uses of electric fans. In general the activity provides for the dissemination of informative items chiefly regarding the non-summer uses of the electric fan. Among the diversified applications of the fan are:

1. To stimulate radiation in cold rooms with hot-air and hot-water heating and to induce circulation in hot-air furnaces.
2. To increase draft in furnace.
3. To speed up the drying of freshly varnished furniture or floors.
4. To speed up the drying of clothes from the wash.
5. To aërate the refrigerator after it has been cleaned.
6. To dehydrate fruits and vegetables.
7. To dry white shoes after cleaning.
8. To dry hair quickly.
9. To cool and ventilate the kitchen.
10. To supply fresh air service to the home and place of business.

It has been suggested that in carrying forward this promotional program the society sponsor a prize offer of some sort to the public as a means of further bringing to attention the fact that the same electric fan which keeps persons comfortably cool in summer will also increase the warmth in homes and places of business during the winter and facilitate drying and cleaning.

Packard Electric Company Adds New Plant

The Packard Electric Company, Warren, Ohio, expects to begin operations March 1 in a new plant which it has just built for the manufacture of transformers. This new plant, provided with all modern manufacturing equipment, has become necessary so as to increase facilities for taking care of the demand for its transformer products and will practically quadruple its capacity for the manufacture of transformers.

All of the activities of the transformer division of the company will be confined to this new modern plant. The old plant will be remodeled and given over entirely to the manufacture of Packard automotive cables.

General Electric Changes Designations of District Offices

The General Electric Company has given new geographic designations to its district office sales territories:

New Designation	Old Designation
Southeastern	Atlanta
New England	Boston
Central	Chicago
East Central	Cincinnati
Rocky Mountain	Denver
New York	New York
Atlantic	Philadelphia
Pacific Coast	Pacific Coast
Southwestern	Southwest G. E. Co.

The new designations are said to describe more accurately the geographic territory covered by the districts.

William E. Quimby, 5 Avenue C, Newark, N. J., has filed plans for the erection of a two-story building, 30 ft. x 57 ft., at his plant at 219 Parkhurst Street, estimated to cost about $22,000.

The Reynolds Electric Company, 2650 West Congress Street, Chicago, announces that its New York office, formerly at 120 West Thirty-second Street, is being moved to 129 West Thirty-first Street. C. W. Ellis is in charge of this office.

The Electric Storage Battery Company, Philadelphia, announces the appointment of J. A. Gould, formerly of the New York office, as manager of the Kansas City branch, effective March 1, to succeed A. W. Pierce.

The Walker & Pratt Manufacturing Company, Boston, has appointed Harry H. Russell, formerly of the Mitchell Vance Company, New York, as its Southern district manager. Mr. Russell will have charge of Walker & Pratt sales in twelve states and will have his headquarters in Atlanta.

The Okonite Company, Passaic, N. J., has appointed the Engineering Materials, Limited, McGill Building, Montreal, as its Canadian representative.

The Crosley Manufacturing Company, Cincinnati, has purchased the factory building of the Thomas I. Corcoran Lamp Company at a cost of approximately $150,000. This new factory makes available 135,000 sq.ft. for the production of radio equipment.

The Westinghouse Electric & Manufacturing Company has received an order from the Georgia Construction Company for central-station generating equipment amounting to $250,000. This apparatus will be installed in the new power station of the Central Georgia Power Company at Macon, Ga.

New Equipment Available

Short Descriptions of New Apparatus and Accessory Equipment of Interest to the Electrical Industry and Available from Manufacturers and Announcements of New Lines

Two-Post 132-Kv. Disconnecting Switch

A new type of disconnecting switch which eliminates the necessity of three insulator posts and which is easily operated even in 132-kv. units has been developed by the Hi-voltage Equipment Company, Cleveland. The switch is mounted so that the blade will rotate in a vertical plane about a horizontal axis. Two insulator supports inclined 45 deg. from the vertical are used, the insulator carrying the contact being stationary and the other, which carries the blade, being attached to a shaft supported on roller bearings. The moving element is balanced so that it can be turned easily with one finger. One end of the blade extends beyond the movable support to a line through the axis of rotation, and jumper may be attached thereto without the objections usually raised to two-post switches. To facilitate operation of the switch when sleet prevails a method whose value has already been proved on other switches of this company's make is used; that is, the combination of a sleet hood over the contact and a jack-knife tip on the "disconnect" blade.

Motor-Operated Automatic-Control Valve

A motor-operated automatic-control valve for industrial heating furnaces, known as the Bristol-Fuller, is now being manufactured by the Bristol Company, Waterbury, Conn. The controller is designed for use in regulating the flow of air and gas, air and oil, and steam and oil, but can also be adapted for the flow of other liquids. Both the fuel and air valves are operated by one electric motor, and their operation is so timed that the oil valve operates slightly ahead of the air valve when the flame is changing from high to low, and vice versa when the flame is changing from low to high.

Large-Capacity Auto-Valve Lightning Arresters

A new large-capacity, station-type lightning arrester for either indoor or outdoor service on alternating-current light and power circuits has been developed by the Westinghouse Electric & Manufacturing Company and is known as the type SV auto-valve arrester. The arrester requires virtually no attention, so that it is particularly suitable for automatic substations.

Transformer Hoist

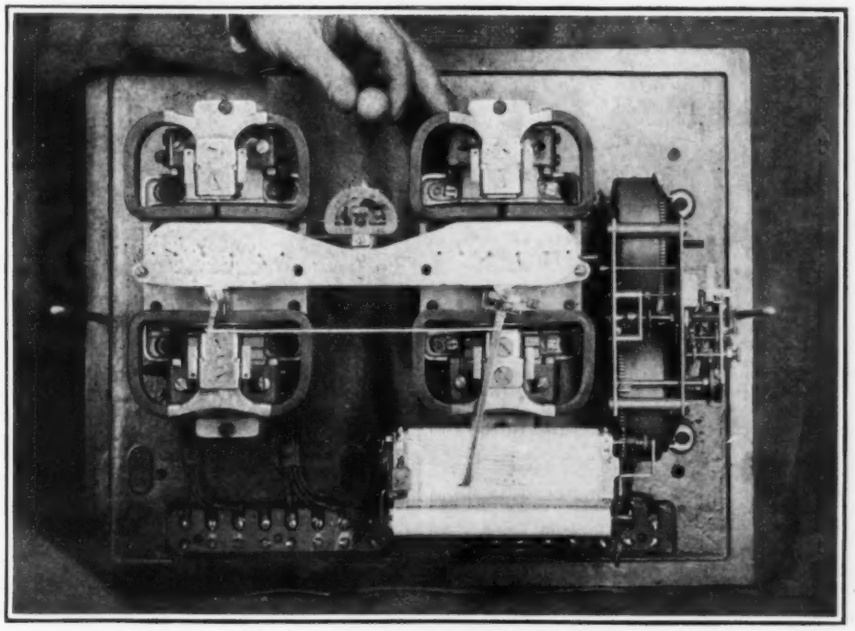
A new type of transformer hoist called a Davit hoist, from its similarity to a boat davit, has been perfected by the Line Material Company, South Milwaukee, Wis. The hoist is provided with two brackets of malleable iron, which are slipped over the cross-arms, and an eye bolt into which the hoisting block is hooked. The brackets will accommodate a cross-arm up to 4 in. x 5 in. in size, the top bracket being adjustable to allow for varying distances between cross-arms.

The lower section of the davit is made of 2½-in. steel pipe and the upper section is made of 2-in. steel pipe swiveling on the lower section so that the transformer can be swung into position. The entire hoist is galvanized, measures 6 ft. 4 in. over all and has a maximum capacity of 1,000 lb.

Kilovolt-Ampere Meter

A kilovolt-ampere meter has just been developed by the Westinghouse Electric & Manufacturing Company. This meter now makes possible the accurate measurement of electricity and is especially well adapted for obtaining data on large power circuits. It gives direct reading of indicated power factor, total kilowatt-hours, total kilovolt-ampere-hours, kilowatt and kilovolt-ampere demand for any predetermined time interval, and the power factor for any time interval, particularly at the time of maximum demand. All this information can be readily obtained by inspection of the dials and the chart of the meter, which is shown in the accompanying illustration.

The mechanism making up the meter is most accurate and ingenious and has been tested thoroughly during the past year by Westinghouse engineers. A technical description of the meter appeared in last week's issue of the ELECTRICAI WORLD.



NEW KILOVOLT-AMPERE METER

New Trade Literature

STREET-LIGHTING EQUIPMENT.—The Line Material Company, South Milwaukee, Wis., has issued catalog No. 24, covering its transmission and distribution material, including street-lighting fixtures and accessories and primary and secondary fuses. It is also distributing a reference chart on the "3500" line of "U-Thru" heavy secondary racks.

GRINDING MACHINES.—Bulletin No. 3,016-S issued by the Hisey-Wolf Machine Company, Cincinnati, describes the "Hisey" wide-swing floor-stand grinder.

INSULATION.—The Philip Carey Company, Cincinnati, is distributing bulletin No. 102, entitled "Heat Losses from Bare Iron Surfaces," which gives a sound basis for determining losses, savings to be made by the use of heat insulation and the per cent efficiency of such insulation.

FANS.—The Robbins & Myers Company, Springfield, Ohio, is distributing its fan catalog form No. 1,222, which describes and illustrates its complete line of fans.

OIL ENGINES.—Catalog N issued by the Bethlehem Steel Company, Bethlehem, Pa., describes the large-unit type of "Bethlehem" oil engines for marine and stationary service.

ELECTRIC RAILWAY INDUSTRY.—"A Brief Outline of the Development and Progress of the Electric Railway Industry" is the title of a fifty-four-page booklet issued by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., which gives a brief history, with illustrations, of the electric railway industry from the installation of the first permanently fixed rails to the production of the powerful electric locomotives of today.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

An agency is desired in San Domingo, Dominican Republic (No. 9,191), for windmills, if possible with attachment for generating electricity, and for electric plants for homes, farms and stores.

Purchase is desired in Glasgow, Scotland (No. 9,192), for carbon brushes for generators and motors.

Purchase is desired in Shanghai, China (No. 9,159), for electrical goods and novelties, wires and cables.

Purchase is desired in Puerto Cortes, Honduras (No. 9,173), for a 25-hp., three-phase, 2,300-volt, alternating-current motor; transformers, 2,300/110 volts; 15 tons copper transmission wire, and other wire and fittings.

Purchase and agency are desired in Dublin, Ireland (No. 9,193), for radio apparatus, both crystal and valve, of cheap and medium grades.

Purchase and agency are desired in Budapest, Hungary (No. 9,190), for copper cakes, wire bars and electrolyte cathodes.

The following inquiries have been received by the Philadelphia Commercial Museum, which will furnish names and addresses of inquirers to any one desiring them and mentioning the number given: Parties in Copenhagen, Denmark (No. 41,699), would like to hear from American manufacturers of radio and radio parts, etc. Parties in Swatow, China (No. 41,713), would like to get in touch with manufacturers and exporters of electrical accessories, etc. Parties in Sydney, Australia (No. 41,736), would like to communicate with manufacturers of telephone and telegraph material and miners' electric and safety lamps, etc.

PROPOSED HYDRO-ELECTRIC PROJECT IN CEYLON, INDIA.—Plans are under way, according to *Commerce Reports*, for a hydro-electric project in Ceylon, India, to cost about 10,000,000 rupees. It is planned to utilize the water power of the Laxapana Falls in the central mountain range of Ceylon.

HYDRO-ELECTRIC PROJECT IN SWITZERLAND.—The right to exploit the water power of the Albigna, according to *Commerce Reports*, has recently been acquired by a Swiss firm. This concession means, it is reported, not only a new source of income for the district but an abolition of danger due to floods from this mountain stream. The retaining wall will be about 49,000 cu.m. long and the plant when completed will develop about 30,000 hp. Further information may be obtained on application to the Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C., or its district offices by referring to No. 119,201.

LIGHT AND POWER CONCESSION GRANTED IN FORMIGAS, BRAZIL.—The municipality of Formigas, State of Minas Geraes, according to *Commerce Reports*, has granted a concession to João Josinho and Augusto Rocha to install and operate an electric light and power service in the districts of Arcos, Panis and Porto Real.

New Incorporations

THE DAYTON HYDRO-ELECTRIC POWER COMPANY, 343 South Dearborn Street, Chicago, has been incorporated with a capital stock of $500,000 by Edward J. Keeley, Fred D. Breit and M. K. Hobbs. The company proposes to construct a hydro-electric plant and transmission lines. The first project will be located on the Fox River, Ohio, where it is estimated that 3,800 kw. will be developed.

THE HAZLETON (IND.) LIGHT & POWER COMPANY has been incorporated with a capital stock of $20,000 by Hamilton M. Arthur, Harry B. Scott and Olive A. Scott.

THE HIDDENITE (N. C.) LIGHT & POWER COMPANY has been incorporated by David Adams and E. E. Lackey to construct and operate an electric transmission system.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

PORTSMOUTH, N. H.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until Feb. 26 for 50,000 weatherproof sockets. (Schedule 1905.)

PROVIDENCE, R. I.—The Narragansett Electric Lighting Company contemplates extensions to its power plant on Eddy Street, to cost about $1,000,000.

WESTERLY, R. I.—The South County Public Service Company is being organized to take over and consolidate the Westerly Electric Light & Power Company; the Wickford Electric Light & Water Company, Wickford, R. I., and the Narragansett Pier Electric Light & Power Company, Wakefield, R. I. Plans include extensions in transmission lines.

PORTLAND, CONN.—The construction of a steam-power plant at the local automobile and equipment depot is under consideration by the State Highway Department.

Middle Atlantic States

BUFFALO, N. Y.—The Niagara, Lockport & Ontario Power Company has petitioned the Public Service Commission for water rights on the Salmon River for hydro-electric development. It is estimated that 45,000 hp. can be developed.

CANASERAGA, N. Y.—The New York Central Electric Corporation, recently organized, is arranging for the purchase of the property of the Canaseraga Electric Company and plans extensions in transmission lines.

FORT TOTTEN, N. Y.—The War Department has approved plans for the installation of an outdoor lighting system, for which bids will be asked at an early date.

GRANVILLE, N. Y.—The Granville Electric & Gas Company has applied for permission to extend its lines in the town of Granville to supply electrical service.

JAMESTOWN, N. Y.—The Western New York Electric Company has applied for authority to extend its electric transmission and distribution lines in the town of Gerry to supply electricity.

NEW YORK, N. Y.—The navy purchasing office, South and Whitehall Streets, will purchase four transformers (N.S.A.F. req. 66).

NEW YORK, N. Y.—The Department of Water Supply, Gas and Electricity, Bronx, plans for extensions in the street-lighting system on Fordham Road between Third Avenue and the Southern Boulevard.

NEW YORK, N. Y.—Plans for the proposed municipal market to be erected at Cromwell Avenue and the Harlem River, at a cost of about $7,500,000, by the Department of Plant and Structures, include an ice-manufacturing, refrigerating and steam-power plant.

ASBURY PARK, N. J.—The Eastern New Jersey Power Company has secured permission to take over and consolidate the Atlantic Coast Electric Light Company, Atlantic Coast Railway Company and the New Jersey Water & Light Company. A bond issue of $3,250,000 is being arranged to finance the project and for expansion purposes.

DUNELLEN, N. J.—Electric power equipment will be installed in the proposed plant to be erected by the Art Color Printing Company, to cost about $100,000. Brutus Gundlach, 331 Madison Avenue, New York, is architect.

JERSEY CITY, N. J.—Steps have been taken by the Jackson Avenue Merchants' Association to secure action on the paving of Jackson Avenue and the installation of a new lighting system.

NEWARK, N. J.—An appropriation of $70,000 for the installation of additional equipment at the power house and water-supply system at the City Hospital, Fairmount Avenue, has been approved by the City Commissioners.

PLAINFIELD, N. J.—The Retail Merchants' Association has petitioned the City Council for the installation of an ornamental lighting in the business district.

PLEASANTVILLE, N. J.—The Peerless Plush Manufacturing Company, 71 Franklin Street, Paterson, is planning to build a local textile mill, including power house, to cost about $250,000.

TITUSVILLE, N. J.—The New Jersey Power & Light Company plans to extend its 33,000-volt transmission line to Titusville and to Washington Crossing and vicinity.

CHAMBERSBURG, PA.—The Council has authorized extensions to the municipal electric light plant, including the installation of a 1,000-kw. turbine. The cost of the work is estimated at about $45,000.

CLEARFIELD, PA.—The Berrysburg Electric Service Company and the Mifflin Electric Service Company, recently organized, plan to erect transmission lines in their respective territories. A. J. Musser, Indiana, Pa., is treasurer of both companies.

LANSFORD, PA.—The Panther Valley Water Company contemplates the installation of electrically operated pumping machinery in connection with a proposed water supply system from Still Creek, to cost about $1,500,000.

PHILADELPHIA, PA.—The Philadelphia Electric Company has filed plans for the construction of a substation at Race and Fifty-sixth Streets, to cost about $42,000; also for extensions and improvements in the power house at Sixth and Federal Streets, to cost $60,000. John T. Windrim, Commonwealth Building, is architect.

PITTSBURGH, PA.—The West Virginia Power & Transmission Company, 14 Wood Street, has secured permission to construct a hydro-electric plant on the Cheat River, about one mile below the Monongalia-Preston County line. The initial unit will cost about $1,500,000. The plans provide for a total development of about 300,000 hp.

SUNBURY, PA.—Plans for the proposed local branch plant of the Cal-Co-Lene Company, Three Rivers, Mich., to cost about $500,000, include a power house.

FRIENDSVILLE, MD.—The Penn Public Service Corporation, Johnstown, Pa., is planning to furnish electrical service in Friendsville. A substation will be erected near here.

CHARLESTON, W. VA.—The Interstate Power Company plans for the construction of a transmission line in Kanawha County.

GRETNA, VA.—The Gretna Roller Mills are making inquiries for a 100-hp. generator and auxiliary equipment for installation at their plant.

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, until March 4 for 1,000 porcelain insulators for the South Brooklyn and Puget Sound navy yards. (Schedule 1910.)

WASHINGTON, D. C.—Bids will be received by the Chief Signal Officer, United States Army, until March 14 for 4,000 switchboard plugs, 2,800 plug shells and 12,000 screws. (Proposal C. P. 16728-1.)

WASHINGTON, D. C.—Plans have been approved by the War Department for extensions and improvements in the electric lighting system, San Juan, P.R., for which bids will soon be asked.

North Central States

DETROIT, MICH. — The Council has authorized the construction of a municipal electric power plant, which will have a capacity of 60,000 kw. and will cost about $11,600,000. The Mayor has also authorized a contract with the Detroit Edison Company, under which it will supply electricity to the Detroit street railway system until Oct. 1, 1926.

LANSING, MICH. — The Hugh Lyons Company is considering the installation of additional equipment in its power plant, including engines, generators, etc.

PORTSMOUTH, OHIO.—The Portsmouth Public Service Company, recently organized, has been granted permission to take over the Portsmouth Street Railroad & Light Company and the Ohio Valley Traction Company. The new company has also received authority to issue $3,000,000 in bonds and $750,000, in capital stock to finance the project.

TOLEDO, OHIO.—Plans have been prepared by the National Ice Company, Fifth and Naghton Streets, Columbus, for the construction of an ice-manufacturing and refrigerating plant at Michigan Avenue and Cherry Street, to cost about $250,000.

WARREN, OHIO. — The Ohio Public Service Company has tentative plans for extensions to its local plant and transmission lines.

BURLINGTON, KY.—The Boone County Electric Service Company, Walton, plans to erect a transmission line, about 9 miles long, to cost about $17,500.

LEBANON, KY.—The Kentucky Utilities Company, Louisville, contemplates erecting a transmission line from Lebanon to the Dix River power site and also extensions to the local system. The cost of the work is estimated at $100,000. G. Bogart is chief engineer.

MORGANFIELD, KY.—The installation of electrically driven pumps in connection with extensions to the municipal waterworks, to cost about $120,000, is under consideration by the Council.

PIKEVILLE, KY.—Bids will be received by the United States Veterans' Bureau, Room No. 791, Arlington Building, Washington, D. C., until March 11 for construction complete, including electrical installation, outside service connection and approach work, of one hospital building, one double officers' quarters, etc., at the United States Veterans' Hospital, Pikeville.

HAZLETON, IND.—The Hazleton Light & Power Company, recently organized, is reported to be planning the erection of a transmission line. Hamilton M. Arthur and Harry B. Scott are interested.

LINN GROVE, IND.—The property of the Linn Grove Light & Power Company has been acquired by the Bluffton Traction Company, which contemplates extensions to the system.

MADISON, IND.—The property of the Madison Light & Power Company has been acquired by the Louisville (Ky.) Gas & Electric Company. The latter company, it is said, will erect a high-tension transmission line from its waterside plant in Louisville to supply electricity in Madison and also to other towns in that territory.

DOWNERS GROVE, ILL. — The Public Service Company of Northern Illinois, Chicago, has acquired the municipal power plant and will extend its transmission line here to supply electricity for local service. Improvements will be made in the local system, to cost about $20,000.

GALVA, ILL.—Bids will be received by A. W. Johnson, City Clerk, until March 4 for one 125-kva. and one 40-kva. generators; for two centrifugal pumps, with capacity of 500 g.p.m., and one compound air compressor. The J. D. Rankin Company, Chicago, is consulting engineer.

MACOMB, ILL. — The trustees of the State Teachers' College plan to build a power plant, to cost about $40,000.

EAU CLAIRE, WIS.—Locations for three large hydro-electric projects on the upper Chippewa River, it is reported, have been selected by the Northern States Power Company. The proposed plants will be located at Radisson and near the towns of Murray and Bruce.

HILLSBORO, WIS.—The Middle Wisconsin Power Company contemplates extending its transmission lines to supply electricity to farmers southeast of Hillsboro, in what is known as German Valley.

LA CROSSE, WIS.—The City Council has authorized the Board of Public Works to secure estimates of cost of installing automatic electric traffic signal lamps to be placed throughout the downtown section of the city.

MERRILL, WIS.—Plans have been prepared by the Wisconsin Valley Electric Company for the erection of a high-tension transmission line from its new dam, under construction, 3 miles north of Merrill, into the city of Merrill, to cost about $80,000.

NEW LONDON, WIS.—The properties of the Star Electric Light, Heat & Power Company, which has been distributing electricity in Maple Creek, Sugar Bush and Bear Creek, has been acquired by the Wisconsin Traction, Light, Heat & Power Company, Appleton. The Star company purchased energy from the Wisconsin company.

PORT WASHINGTON, WIS.—The Council is considering the installation of an ornamental lighting system, to cost about $10,000. The plans provide for forty lamp standards.

RACINE, WIS.—Electric power equipment will be installed at the local plant of the Mitchell Motor Car Company, recently acquired by the Nash Motors Company, Kenosha.

STOUGHTON, WIS. — Steps have been taken by the Chamber of Commerce for the installation of an ornamental lighting system in the downtown section of the city.

SUPERIOR, WIS. — Steps have been taken by the Chamber of Commerce to secure the installation of an ornamental lighting system in the downtown section.

WAUSAU, WIS.—Plans are under consideration by the Wisconsin Valley Electric Company for the construction of three substations, to be located at Tomahawk, Jersey City, and at the plant of the Tomahawk Kraft Paper Company, Mosinee.

BRAINERD, MINN. — The Northern States Power Company, we are informed, does not contemplate building a power house in Brainerd, as reported in the issue of Jan. 12.

DULUTH, MINN.—The Minnesota Power & Light Company has acquired the plant of the Cuyuna Range Power Company at Brainerd, including the transmission lines leading to other Cuyuna range towns and mines, together with water-power sites at Pillager and Crow Wing River, near Brainerd.

ST. CLOUD, MINN.—The St. Cloud Public Service Company plans to rebuild at once its local generating plant, recently damaged by fire with loss of about $100,000.

SHAKOPEE, MINN.—The installation of a new street-lighting system on all important thoroughfares is under consideration.

CEDAR RAPIDS, IOWA.—Surveys are being made by the Iowa Railway & Light Company for the erection of a high-tension transmission line from Cedar Rapids to Quasqueton, to connect with a line there, extended from Oelwein.

FORT DODGE, IOWA.—The Northwestern Manufacturing Company has filed plans for the construction of a local power plant.

PISGAH, IOWA.—A special election has been called to vote on the proposal to issue $12,500 in bonds for the installation of an electric lighting system.

FLORENCE, MO.—The Missouri Utility Company, Mexico, has been granted a twenty-five-year franchise to furnish electricity in Florence.

HARTVILLE, MO.—A petition will be presented to the City Council asking that an election be called to vote on the proposal to issue $10,000 in bonds to build a dam on Gasconade River, near Hartville, to provide power for an electric light plant.

ST. JOSEPH, MO.—The installation of electrically operated pumping machinery in connection with proposed extensions to the municipal waterworks, to cost about $600,000, is under consideration by the Board of Public Works. W. K. Seitz is engineer in charge.

TROY, MO.—The East Missouri Power Company is planning extensions in its transmission lines from Troy to Wright City, Wentzville and vicinity.

ST. LOUIS, MO.—Contract has been let to the Union Electric Light & Power Company for the installation of an ornamental street-lighting system on the Delmar Boulevard from Harvard Avenue to Skinker Road.

CRETE, NEB.—A special election will be held on March 11 to vote on an issue of $45,000 in bonds for improvements to the municipal electric plant.

KEARNEY, NEB.—The proposal to issue $135,000 in bonds to install a municipal utility plant in connection with the municipal water-works system has been approved by the voters.

OMAHA, NEB.—The Trustees of Creighton University are considering erecting a power plant at Twenty-fourth and Burt Streets.

RUSHVILLE, NEB.—The Sheridan Electric Service Company is considering an extension to its plant.

FORT LEAVENWORTH, KAN. — Plans have been approved by the War Department for extensions and repairs in the local steam-turbine generating plant, for which bids will be asked at an early date.

FORT RILEY, KAN.—Plans have been approved by the War Department for extensions in the local light and power system, for which bids will soon be asked.

LARNED, KAN. — Extensions to the municipal electric plant, to cost about $45,000, are under consideration by the City Council. It is proposed to increase the output from 485 hp. to 1,185 hp.

LEON, KAN. — The City Council has authorized the city clerk to advertise for bids for the construction of an electric distributing system, installation of street lamps and the erection of a transmission line to the substation at Augusta. George L. McClenny is city clerk.

Southern States

ATLANTA, GA. — The Central Georgia Public Service Company has petitioned the Public Service Commission for authority to issue $1,000,000 in capital stock and $2,250,000 in bonds, the proceeds to be used for the construction of a steam-driven power plant in Bibb County.

HINESVILLE, GA.—The installation of an electric lighting system is under consideration. H. Lowe and others are interested.

FELLSMERE, FLA.—Work has started by the Standard Agricultural & Chemical Company on the construction of a new plant for the manufacture of fertilizer products, to cost about $375,000. The plans include an electric generating plant.

ORLANDO, FLA. — The Florida Public Service Company, recently organized, has acquired the properties of the Orlando (Fla.) Public Service Company, the Orlando Gas Company, the Florida Ice & Power Company, Lake Wales; the DeLand (Fla.) Electric Light, Power & Ice Company, and the Eustis (Fla.) Light & Water Company. The combined company supplies electricity in twenty-one communities in central Florida.

PAHOKEE, FLA.—The Pahokee Utilities Company, recently organized, plans to build an electric plant and ice factory to furnish electricity and ice to residents along East Beach.

CUMBERLAND, TENN. — The Erin (Tenn.) Utilities Company has been granted a franchise to erect a transmission line from Erin to Cumberland (8 miles) to furnish electrical service here.

JACKSON, TENN. — Improvements and extensions are contemplated by the Jackson Railway & Light Company, to cost about $95,000. The work will include the installation of a 2,000-kw. turbine and a 505-hp. Stirling boiler.

LEWISBURG, TENN.—The City Council is considering the installation of electrically operated pumps in connection with proposed extensions to the waterworks, to cost about $150,000.

SPRINGFIELD, TENN.—The Tennessee Electric Power Company has contracted to furnish local service and plans to erect a transmission line.

FLORENCE, ALA.—Bids will be received by the United States District Engineer, Florence, until March 22 for four 32,000-kva., three-phase, 60-cycle, 12,000-volt vertical-shaft, revolving-field type electric generators, to cost about $750,000.

CALICO ROCK, ARK.—A franchise has been granted to C. F. Phipps, Denver, Col., to install an electric lighting system in Calico Rock.

MIAMI, OKLA.—The construction of a new concentrating plant and power house, to cost about $100,000, is under consideration by the Enterprise Mining Company.

NEWKIRK, OKLA.—The installation of electrically operated machinery in connection with proposed extensions to the waterworks, to cost about $100,000, is under consideration by the City Commission.

JACKSONVILLE, TEX.—The Texas & New Orleans Railroad Company contemplates building locomotive and car repair shops, including a power house, in Jacksonville, to cost about $250,000. H. M. Lull is chief engineer.

NAVASOTA, TEX.—The Western Public Service Company has started work on a power plant which will supply electricity in Navasota and a number of nearby towns. A high-tension transmission line will be erected by the company during the year connecting the Navasota plant with other stations owned by the company.

Pacific and Mountain States

BLAINE, WASH.—The Wyatt & Miller Lumber Company, recently organized, plans to build a local plant and power house, to cost about $100,000.

FORT MILEY, CAL.—Plans have been approved by the War Department, Washington, D. C., for converting the present oil-burning pumping station to electric operation and for the installation of additional equipment, for which bids will soon be asked.

LA VERNE, CAL.—Plans are being discussed for the installation of an ornamental lighting system to cost about $15,000. The Chamber of Commerce is interested.

LIVERMORE, CAL.—Bids will be received by the United States Veterans' Bureau, Room No. 791, Arlington Building, Washington, D. C., until March 28 for construction of an ice-making and refrigerating plant at the United States Veterans' Hospital, Livermore.

LONG BEACH, CAL.—The City Council has approved plans for the installation of an ornamental lighting system in the vicinity of Seaboard Boulevard and Pine Street, along the beach front.

LOS ANGELES, CAL.—Plans have been approved by the City Council for the installation of an ornamental lighting system on Browning Boulevard from Western to Van Ness Avenue, also for the installation of twenty-four standards on Sixth Street.

LOS ANGELES, CAL.—Plans have been approved by the municipal art commission for ornamental lamp standards for Flower Street, similar to those used on Broadway, and for Moneta Avenue, the same type as those used on Hollywood Boulevard, to cost about $297,000. Petitions for the installation of ornamental lamp standards on portions of Gramercy Place, Grand Avenue and Rimpau Boulevard have been approved by the city engineer.

MARYSVILLE, CAL. — Extensions are contemplated by the Pacific Gas & Electric Company to cost about $86,000, of which $36,000 will be used for equipment for the Marysville substation, $10,000 for addition to the Colgate power station, and $40,400 for the construction of a new power station near Princeton, which will be known as the Rico substation.

NEWPORT BEACH, CAL.—The contract for work in the Peninsula tract has been awarded to the California Construction Company, for $249,508. The work will include pavements and sidewalks, laying of water and gas mains and installing an ornamental lighting system.

OAKLAND, CAL.—The H. J. Heinz Company, 1062 Progress Street, Pittsburgh, Pa., plans to construct a power house at its proposed local plant at Fifth and Belle Streets, to cost about $1,000,000.

OROVILLE, CAL.—The Feather River Power Company has commissioned Lars Jorgensen, Hobart Building, San Francisco, engineer, to prepare plans for the construction of three hydro-electric power plants, which will be located on the Ament and Grizzly Creeks and Gold Lake.

SACRAMENTO, CAL.—Plans for the proposed canning factor to be erected on Sixteenth to Eighteenth Streets by the California Packing Company, 101 California Street, San Francisco, to cost about $1,000,000, include a power house and an ice-manufacturing and refrigerating plant. Philip L. Bush is engineer.

SAN FRANCISCO, CAL.—The Board of Supervisors has appropriated $591,000 for the towers for the Hetch Hetchy power transmission line.

SAN FRANCISCO, CAL.—The Pacific Gas & Electric Company plans to install additional equipment in its substation on Jessie Street, near Third Street, to cost about $20,000.

Electrical Patents

Announced by U. S. Patent Office

(Issued Jan. 29, 1924)

1,482,362. ELBOW FOR WIRING CONDUITS; J. A. Volk, Jr., Norwalk, Conn. App. filed Aug. 1, 1922. Adapted for use in any position with opening always accessible.

1,482,374. CORD CIRCUIT; A. J. Seymour, St. Paul, Minn. App. filed Jan. 13, 1919. For manually operated switchboards.

1,482,375. MEANS FOR EFFECTING PHASE ADJUSTMENT OF ELECTRICAL SYSTEMS: F. E. Pernot, London, England. App. filed Feb. 15, 1923. For maintaining synchronism between two or more systems.

(Issued Feb. 5, 1924)

1,482,462. ELECTRICAL TESTING DEVICE; F. Dubsky, Pittsfield, Mass. App. filed Jan. 31, 1921. Voltage testing of insulation.

1,482,540. SIGNAL DEVICE FOR AUTOMOBILES; R. B. Benjamin, Chicago, Ill. App. filed June 18, 1917.

1,482,541. WELDED COLUMN AND PROCESS OF MAKING IT; L. Braisted, Wellesley, Mass. App. filed Aug. 14, 1922.

1,482,557. COMPOSITE SIGNALING SYSTEM; B. P. Hamilton, Brooklyn, N. Y. App. filed Sept. 23, 1919. When carrier signals are superimposed upon telephone lines.

1,482,558. ALTERNATING-CURRENT SIGNALING APPARATUS; B. P. Hamilton, Brooklyn, N. Y. App. filed Sept. 26, 1919. For transmission systems.

1,482,574. ELECTRICAL HEATER FOR AUTO RADIATOR SYSTEMS; S. L. Meyer, Milwaukee, Wis. App. filed Feb. 16, 1920. Mounted in a fitting.

1,482,588. TELEPHONE RECEIVER; G. M. Stratton, Salt Lake, Utah. App. filed Sept. 12, 1922. To amplify the effect of the coil upon the diaphragm.

1,482,603. ELECTRIC LAMP SOCKET; F. A. Faulhaber, Jr., East Orange, N. J. App. filed June 7, 1922. Bayonet type.

1,482,607. AGITATION SEPARATOR; A. M. Gow, Duluth, Minn. App. filed Nov. 17, 1920. For separating particles of differing characteristics.

1,482,618. TELEPHONE-EXCHANGE SYSTEM; L. Polinkowsky, New York, N. Y. App. filed June 14, 1919. Machine switching type.

1,482,625. DISTRIBUTING SWITCH; G. Thomson, Mount Vernon, N. Y. App. filed Set. 4, 1919. For automatic telephone-exchange systems.

1,482,712. TESTING SYSTEM FOR AUTOMATIC EXCHANGES; F. A. Stearn, Paterson, N. J. App. filed Oct. 3, 1919.

1,482,714. AUTOMOBILE CIRCUIT TESTER; E. C. Stillger, Burlington, Col. App. filed Oct. 3, 1922.

1,482,791. REGULATOR; G. M. Hafer, Detroit, Mich. App. filed Sept. 14, 1921. For automatically controlling furnace heating, etc.

1,482,822. DIRECTION INDICATOR FOR AUTOMOBILES OR OTHER VEHICLES; D. U. Stanage, Oakland, Cal. App. filed May 8, 1919.

1,482,833. ELECTRIC COUPLER; R. G. Averill, Mansfield, Ohio. App. filed June 7, 1919. For coupling together electric circuits between two coupled cars.

1,482,865. SWITCH BOX; C. Raus, Cleveland, Ohio. App. filed May 29, 1920.

1,482,872. STORAGE BATTERY; L. G. Stecker, Philadelphia, Pa. App. filed Oct. 11, 1922. Special construction and arrangement of plates and separators.

1,482,891. FARADIC MEDICAL APPARATUS; J. J. Ghegan, East Orange, N. J. App. filed April 28, 1919. For use by unskilled patients.

1,482,911. ELECTRIC SWITCH; H. Catlin, Fairfield, Conn. App. filed July 7, 1922. For preventing the operation of one of two switches controlled by a single operating device.

1,482,968. TRANSMITTER FOR ELECTRIC RECORDING AND SIGNALING SYSTEMS; A. B. Buckley, Cairo, Egypt. App. filed June 14, 1921. For transmitting and recording variations in the level of a fluid, etc.

1,483,005. ELECTRIC FENCE; A. D. McNair, Fayetteville, Ark. App. filed July 23, 1921. Automatically energized.

1,483,010. ELECTRICAL THERAPEUTIC DEVICE; S. E. Peden, St. Louis, Mo. App. filed Dec. 5, 1922. Portable type.

1,483,039. METER; J. W. Bickel, Chicago Heights, Ill. App. filed Jan. 27, 1921. Maximum-demand meter.

1,483,055. ELECTROMECHANICAL LAMP; P. Blot, Paris, France. App. filed March 14, 1922. Pocket type.

1,483,056. METALLURGICAL PROCESS; W. E. Greenawalt, Denver, Col. App. filed Dec. 6, 1921. Hydro-metallurgical extraction of copper from its ores.

(Issued Feb. 12, 1924)

15,762 (reissue). MEASURED SERVICE TELEPHONE SYSTEM; J. Wicks, Chicago, Ill. App. filed May 24, 1921. Relates to automatic telephone system.

1,483,064. MOTOR-CONTROLLING DEVICE; B. S. Aikman, Milwaukee, Wis. App. filed Oct. 14, 1919. For operating air compressor.

1,483,091. STORAGE-BATTERY CASING; L. Imblum, Pueblo, Col. App. filed Dec. 23, 1921. For automobile ignition and starting batteries.

1,483,133. ELECTRICAL TESTING SYSTEM; J. F. Toomey, New York, N. Y. App. filed June 10, 1921. Determines condition of vacuum-tube amplifiers.

1,483,162. MECHANICAL MOVEMENT; V. R. Respard, Hinsdale, Ill. App. filed Sept. 19, 1919. Chain-socket switch.

1,483,172. SIGNALING SYSTEM; D. K. Gannett, Arverne, N. Y. App. filed April 19, 1920. Elimination of interference in telephone cables.

1,483,173. SWITCH-OPERATING APPARATUS; D. D. Gordon, Chicago, Ill. App. filed April 20, 1918. Chain socket switch.

1,483,179. MEANS FOR CONTROLLING ELECTRICAL TRANSMISSION; J. S. Jammer, New York, N. Y. App. filed June 17, 1922. Carrier transmission on telephone lines.

1,483,221. ELECTRIC INDUCTION FURNACE; O. Frick, Herserud, Sweden. App. filed Jan. 16, 1922. For melting and refining steel.

1,483,235. SYSTEM FOR TRANSMITTING SETTINGS; R. V. Morse, Ithaca, N. Y. App. filed July 26, 1919. Control of ordnance when firing at moving target.

1,483,237. LINE TAPPER; A. Moulton, Philadelphia, Pa. App. filed Feb. 12, 1921. Snap clamp for electrical conductors.

1,483,273. CIRCUIT FOR HEATING THE FILAMENTS OF AUDIONS; D. G. Blattner, Bogota, N. J. App. filed Oct. 4, 1920.

1,483,280. SELF-CONTROLLING HEATER; F. H. Cherry, Berkeley, Cal. App. filed Jan. 10, 1923. Water heater.

1,483,281. METHOD AND APPARATUS FOR TRANSFORMING DIRECT CURRENT; G. B. Coleman, San Francisco, Cal. App. filed Oct. 16, 1919. Rotary converter.

1,483,315. HEAD-TELEPHONE RECEIVER; H. G. Saal, Chicago, Ill. App. filed Aug. 10, 1922. Means of adjusting to head.

1,483,339. PERMANENT MAGNET FOR ELECTRIC MACHINES; C. F. Dufaux, Geneva, Switzerland. App. filed Aug. 23, 1921. Steel plate bent to a cylindrical surface with slit separating poles.

1,483,353. TAPE RECORDER; E. E. Kleinschmidt, Brooklyn, N. Y. App. filed June 21, 1920. For fire-alarm stations, etc.

1,483,355. LAMP; A. B. Kupsche, Chicago, Ill. App. filed March 30, 1922. Portable type adapted to any position.

1,483,383. RADIO RECEIVING SYSTEM; H. K. Sandell, Chicago, Ill. App. filed Nov. 2, 1922.

1,483,400. TELEPHONE SYSTEM; R. S. Wilbur, Lyndhurst, N. J. App. filed Dec. 31, 1919. Composite ringing repeater circuit.

1,483,417. LIGHTING FIXTURE; L. C. Doane, Cleveland, Ohio. App. filed Sept. 8, 1920. Totally inclosed lighting unit readily accessible.

1,483,427. ELECTRIC HEATING DEVICE; E. G. Gaynor, Stratford, and L. T. Wilson, New Haven, Conn. App. filed Nov. 3, 1921. For electric flatirons, etc.

1,483,432. DEMAND METER; C. I. Hall, Fort Wayne, Ind. App. filed July 19, 1921. Recording type.

1,483,438. AUTOMATIC RECLOSING CIRCUIT-BREAKER SYSTEM; F. H. Hedin, Willimantic, Conn. App. filed Oct. 25, 1922. Where circuit is controlled by an electron discharge tube.

1,483,439. SYSTEM OF CONTROL; R. E. Hellmund, Swissvale, Pa. App. filed March 11, 1919. For regulating power factor of motors under varying-load conditions.

1,483,441. MOTOR CONTROL SYSTEM; L. J. Hibbard, Wilkinsburg, Pa. App. filed Nov. 12, 1920. For operating cranes, hoists, etc.

1,483,444. TELEGRAPH KEY; S. C. Hoey, Wilkinsburg, Pa. App. filed Dec. 14, 1918. For outdoor use.

1,483,446. ELECTRICAL SYSTEM; G. W. Huey, Wilkinsburg, Pa. App. filed June 8, 1917. For operating rolling mills, etc.

1,483,449. ELECTRIC LAMP FOR PROJECTION APPARATUS; B. Johnson, Newark, N. J. App. filed Sept. 15, 1921.

1,483,453. OUTLET BOX; H. G. Knoderer, Englewood, N. J. App. filed Dec. 18, 1922. Built up from unit parts.